Devices for the Hearing Impaired.

Rehabilitation Engineering Aids and Devices For Persons with Impaired Hearing

02/08/79

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CARDBOARD CARPENTRY

One of the simplest and more economical methods for constructing therapy equipment is cardboard carpentry.

Cardboard carpentry: constructing furniture, toys, adaptive equipment from Tri-Wall, a triple thick cardboard.

A. Why Cardboard (Tri-Wall)

1. Tri-Wall is inexpensive compared to wood.

   Ex. $5.00 for 4' X 6' sheet Tri-Wall versus

   $15.00 for 4' X 8' sheet plywood

2. Tri-Wall is lightweight.

3. Tri-Wall is sawdust free if the proper tools are used.

4. Tri-Wall, finished or unfinished, doesn't splinter.

5. Tri-Wall doesn't have to be finished, or if finished, it is generally a faster process than with wood (no sanding).

6. Tri-Wall provides optional performance. If it is treated well and constructed with tape, paint, plastic, Tri-Wall can be made to last indefinitely even under rough treatment. On the other hand, it can be constructed quickly, using little or no finishing techniques, deliberately serving for only the present.

7. The skills necessary to work with Tri-Wall are very easy to acquire, being for the most part, skills we already have.

8. Tri-Wall is a forgiving material - a fairly straight cut is usually as good as a perfectly straight one.

9. Most important, we can make adaptive equipment by ourselves, quickly, easily, and free from the necessity of describing or justifying what we want and need to carpenters, purchasing agents, etc.

However, we found that some types of equipment can be made faster and be sturdier when constructed from wood. For example, T-stool, hammock frame, tilt board.

B. Tools Needed to Work with Tri-Wall

1. The following tools are readily available and inexpensive and are all that is needed to construct with Tri-Wall.

   - paring knife: serrated or scalloped edge is easiest.

   - utility knife (matte knife): knife with razor type cutting blade that can be replaced when dull. You can cut a straight line by making the blade run alongside a metal ruler.

   - handsaw: saws straight lines quickly.

   - keyhole saw: saws curves.

   - hammer

   - mallet

   - C-clamps, string clamps, and/or weights: to hold things together while you glue.

   - rulers, tape measures

2. A sabre saw is the fastest method of cutting straight and curved pieces. If you use a knife blade (available from Sears through the catalog), there is no sawdust and the edges are smooth. If you clamp a metal ruler or 2" X 2" pieces of wood on line, you can saw a very straight line.

3. The following tools were constructed especially for cardboard carpentry and are available through the catalog from Workshop for Learning Things, Inc., 5 Bridge Street, Watertown, MA 02172.

   - strip cutter: X-acto blade tool cuts strips from ½" to 30".

   - slot cutter: cuts slots accurately.

   - V-groove cutter: cuts a V groove in cardboard, along which the cardboard can be creased for folded.

   - thread cutters: tap and die for making large nuts and bolts from dowels and wooden squares.

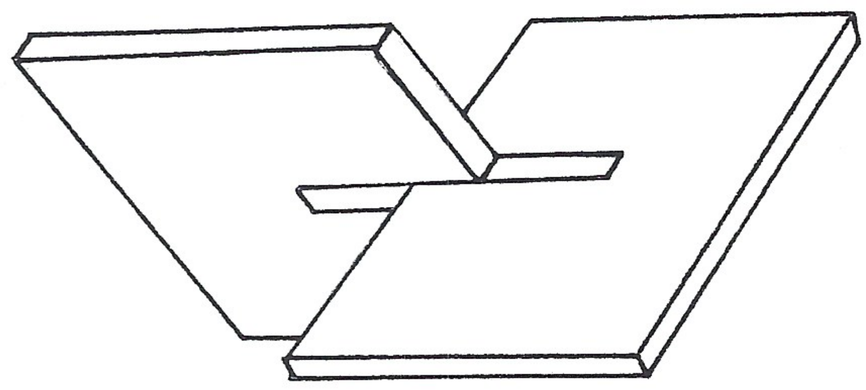
- circle cutters: several different circle cutters are available that can cut circles from ½" to 54".

- double bladed hacksaw: a regular hacksaw with two blades for cutting slots.

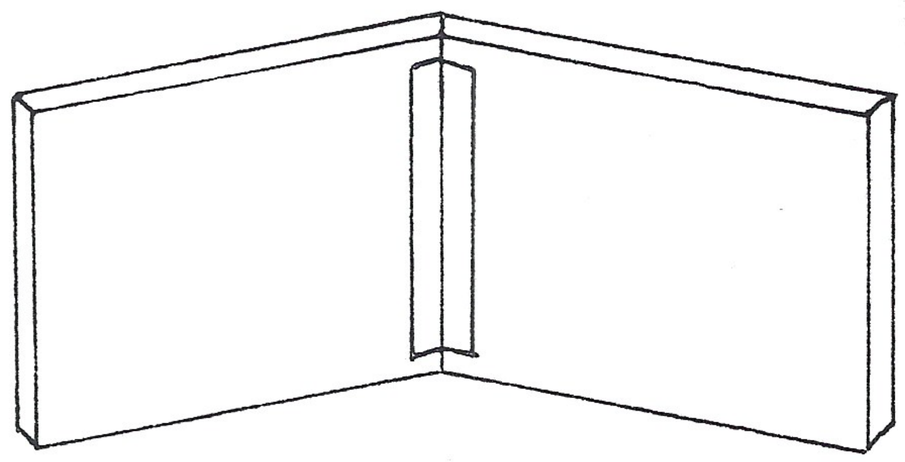
C. Construction Methods

1. Methods of joining cardboard include:

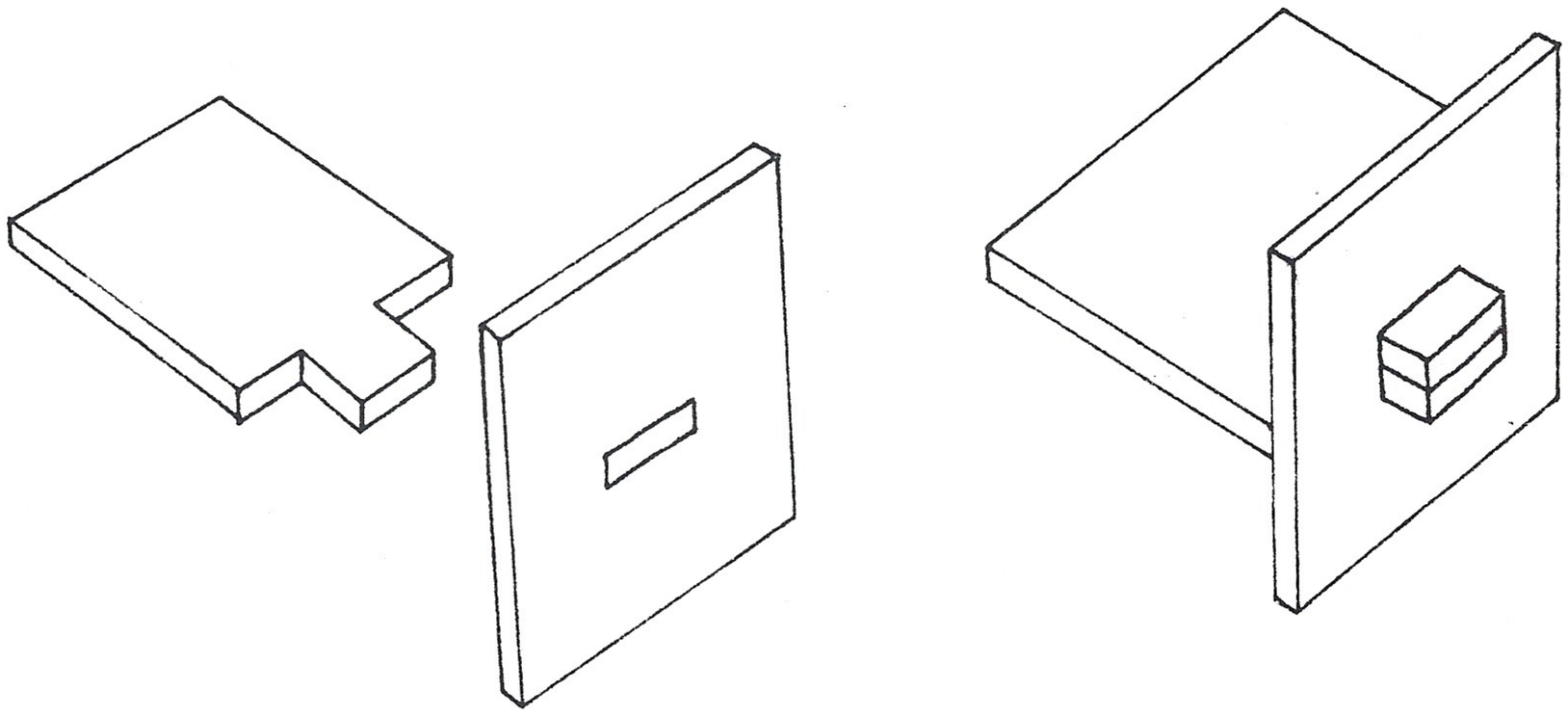
a. Slots: a slot ½ of width is cut in both pieces to be joined. The width of slot is width of Tri-Wall. The slot needs to be at least 2½" from edge of Tri-Wall.



b. Tape: paper tape, cloth tape, sticky tape; tape needs to be 2" wide.

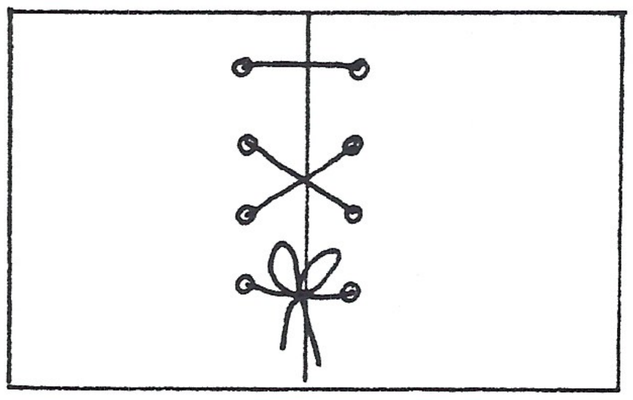


c. Slot and Tongue:



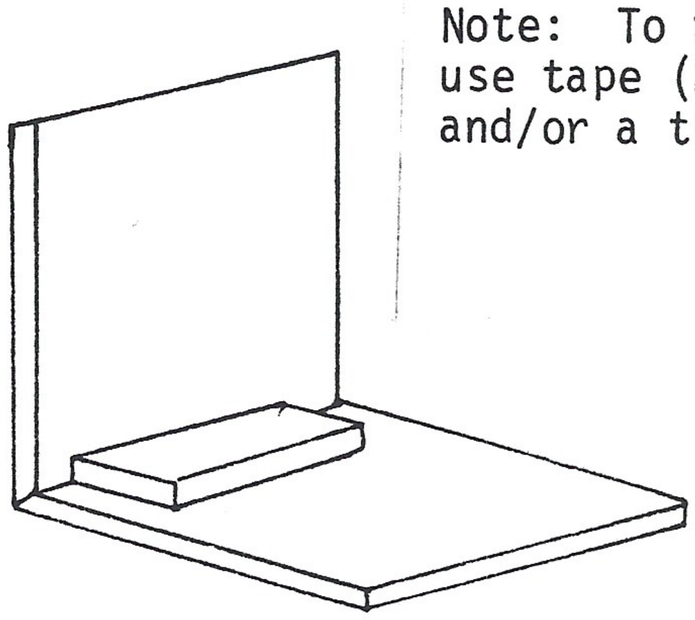
d. Pegging and Glueing: Use ¼" dowel, mushroom top by pounding on with a mallet. Sharpen other end in pencil sharpener. Start hole, dip in glue, and finish pounding peg in.

e. Lacing: Make holes in pieces to be joined at least 1" from the edge. Use rope and lace the edges together.



f. Strips of Tri-Wall: Use strips of Tri-Wall along edges to be joined. Glue and tape strips to the pieces being connected.

Note: To reinforce all joints you can use tape (2" as described in #b above) and/or a thread of glue along joint edges.



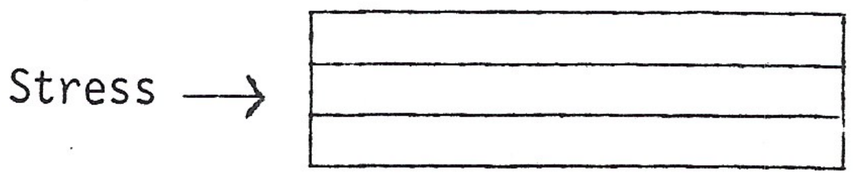
2. Methods of Folding Cardboard

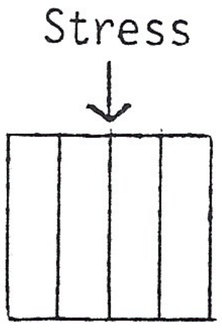
Ex. make a corner

a. Score with screwdriver, pound a 1/2" to 3/4" dowel along fold-line. Bend toward crushed side.

b. Make a V groove on the side of the cardboard inside the fold. Can use a matte knife or paring knife. Make sure you don't cut through the final thickness of the cardboard.

Note: The cardboard has a grain. Generally, the heaviest stress should be against the grain.





D. Finishing Methods

1. Tape edges with 2" tape for a more finished look.

2. Paint

3. Cover with cloth, vinyl, burlap - folding around edges and taping.

4. Cover with contact paper, wallpaper.

5. Cover with plastic to waterproof.

Note: If you paint or glue one side of the cardboard, it can warp. It is recommended that you do both sides if possible or else take precautions against warping.

Can you come up with any ideas for adaptive equipment made from cardboard?

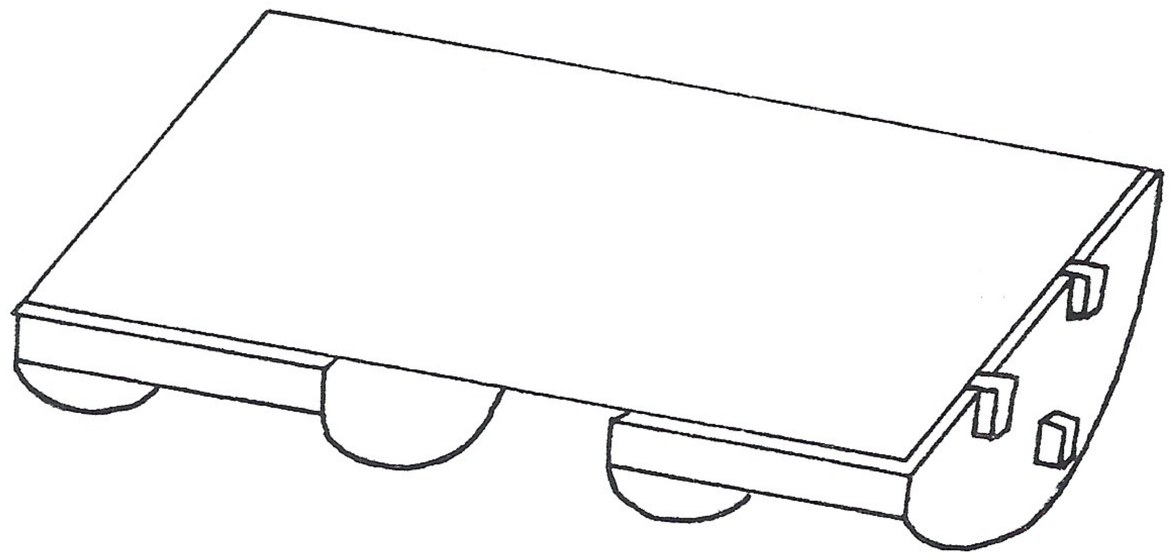
EQUIPMENT TO MEET A VARIETY OF THERAPY OBJECTIVES FOR A VARIETY OF CHILDREN

VESTIBULAR BOARD

1) To facilitate righting, equilibrium, and balance reactions in the prone, supine, sitting, 4 point, kneeling, and standing positions.
2) To enable weight bearing and weight shifting in upper and lower extremities.
3) To stimulate trunk rotation.
4) To increase head and trunk control.
5) To provide stimulation of vestibular system in all positions.
6) To allow portability of Vestibular Board: classroom to classroom and by car.
7) To allow for availability of Vestibular Board at a fraction of the retail cost.

Precautions and Considerations:

1) Do not leave student unattended on board.
2) Take precautions to keep child from falling off the board.
3) Be aware of overstimulating or overinhibiting the student-watching for extreme fearfulness, pallor, hyperventilation, perspiration, sudden drowsiness, or dizziness.
4) Try to incorporate games into activity to divert attention.
5) Prevent board from rocking by placing small blocks under each end of board (check to see if it slips).



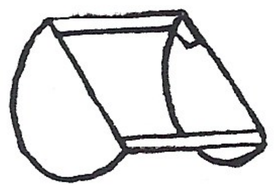
VESTIBULAR BOARD

Supplies: Tri-wall — piece of rug 43" X 28"
white glue — floor adhesive
2" gummed tape — paint

Estimated Cost: $15.00

Directions:

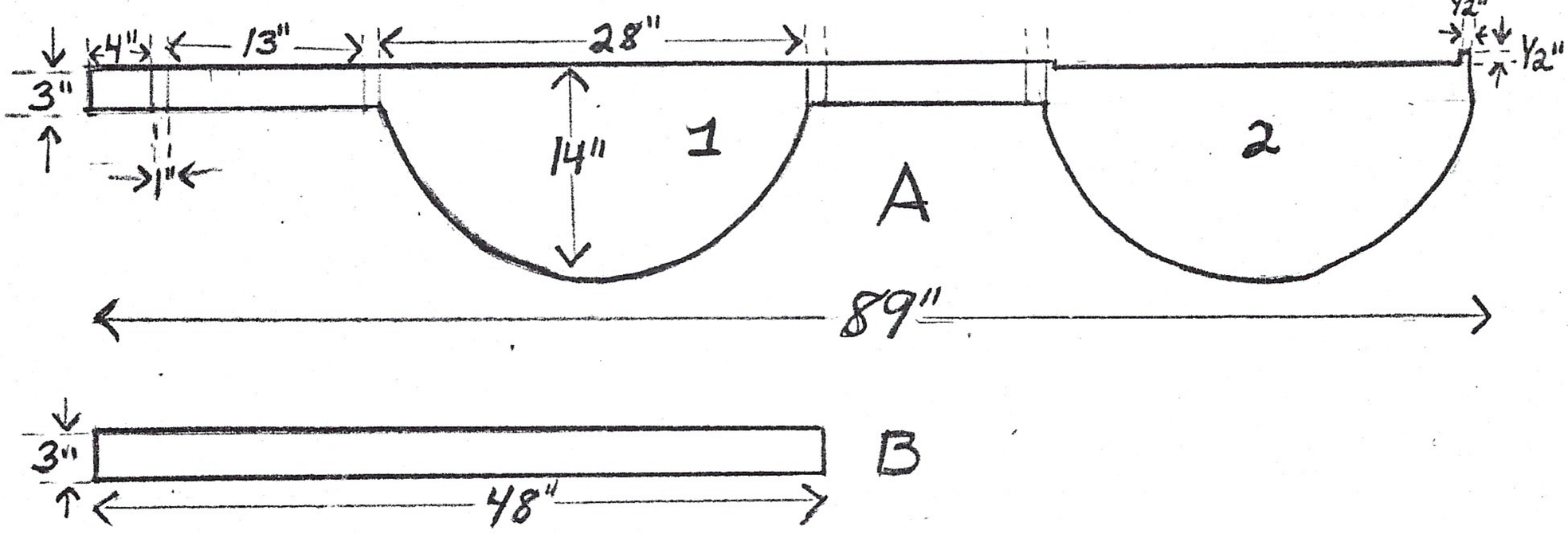
1. Cut 2 A, cutting out slots as indicated on diagram; cut 3 B; cut 4 C, cutting out slots as indicated in diagram; cut 1 D; and Cut 12 E.
2. Score (V groove through top two layers of cardboard) between the 1" marking of the A pieces. Bend to 90°.
3. Glue C pieces on rockers of A's - on the inside of rocker 1 and outside of rocker 2. Tape together with masking tape while drying.
4. Glue, and tape, 4" ends of A's on inside part of rocker 2 to form 2:

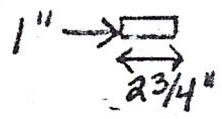


5. Place the B's through all the slots.
6. Place D on top - it should sit on the two top B's with the tops of the rockers forming an edge.
7. Turn over, glue and tape all joints very securely.
8. Add E's on both sides of the lowest B support where it goes through rockers to keep rockers from bending in or out.
9. The top 2 B's: fold back the ends and tape down.
10. Paint.
11. Using floor adhesive, glue rug on top.

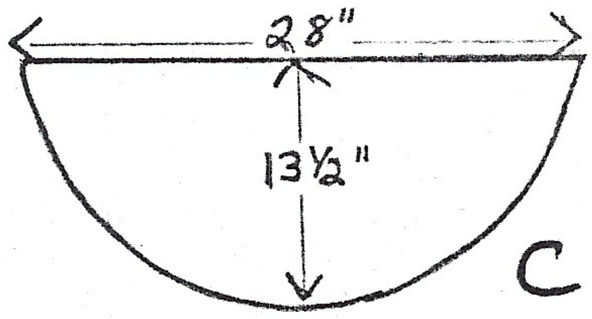
Vestibular Board

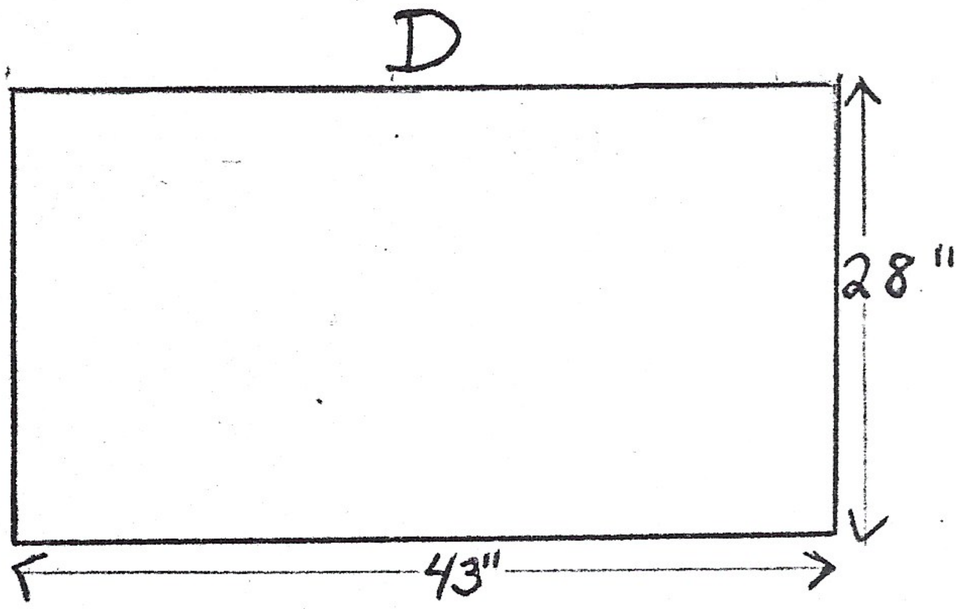
scale 1/16" = 1"





E



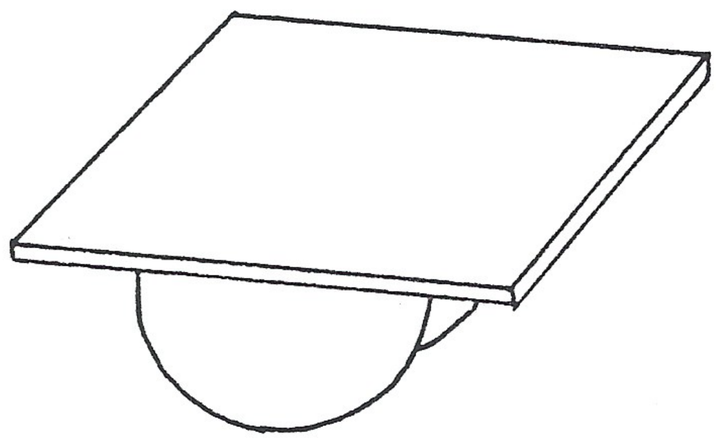


ROCKER BOARD (Small Tilt Board)

1) To facilitate righting, equilibrium, and balance reactions in sitting, kneeling, and standing positions.
2) To enable weight bearing and weight shifting in upper and lower extremities.
3) To stimulate trunk rotation.
4) To increase trunk control.
5) To provide stimulation of vestibular system in sitting, kneeling, and standing.
6) To allow for availability of a rocker board at a nominal cost and with minimal construction time.

Precautions and Considerations:

1) Do not leave student unattended on board.
2) Take precautions to keep child from falling off the board.
3) Be aware of overstimulating or overinhibiting the student- watch for extreme fearfulness, pallor, hyperventilation, perspiration, sudden drowsiness, or dizziness.
4) Try to incorporate games into activity to divert attention.
5) Prevent board from rocking by placing small blocks under each end of board (check, make sure it doesn't slip).



ROCKER BOARD

Supplies: 15 inch wooden spool cut in half
plywood
cabinet handles
corner brackets
screws

Estimated Cost: wooden spool - 50¢
plywood - $1
cabinet handles - $2
corner brackets - $2
screws - expendible

Total Cost = $5.50

Directions:

1. Use saber saw to cut spool in half (use knife blade for cardboard piece holding wooden pieces together).

2. Use saber saw (wood blade) to cut plywood - desired size - illustration is 22" X 26".

3. Center straight edges of spool on board. Care must be taken to center spool on bottom of board to allow balancing of the board.

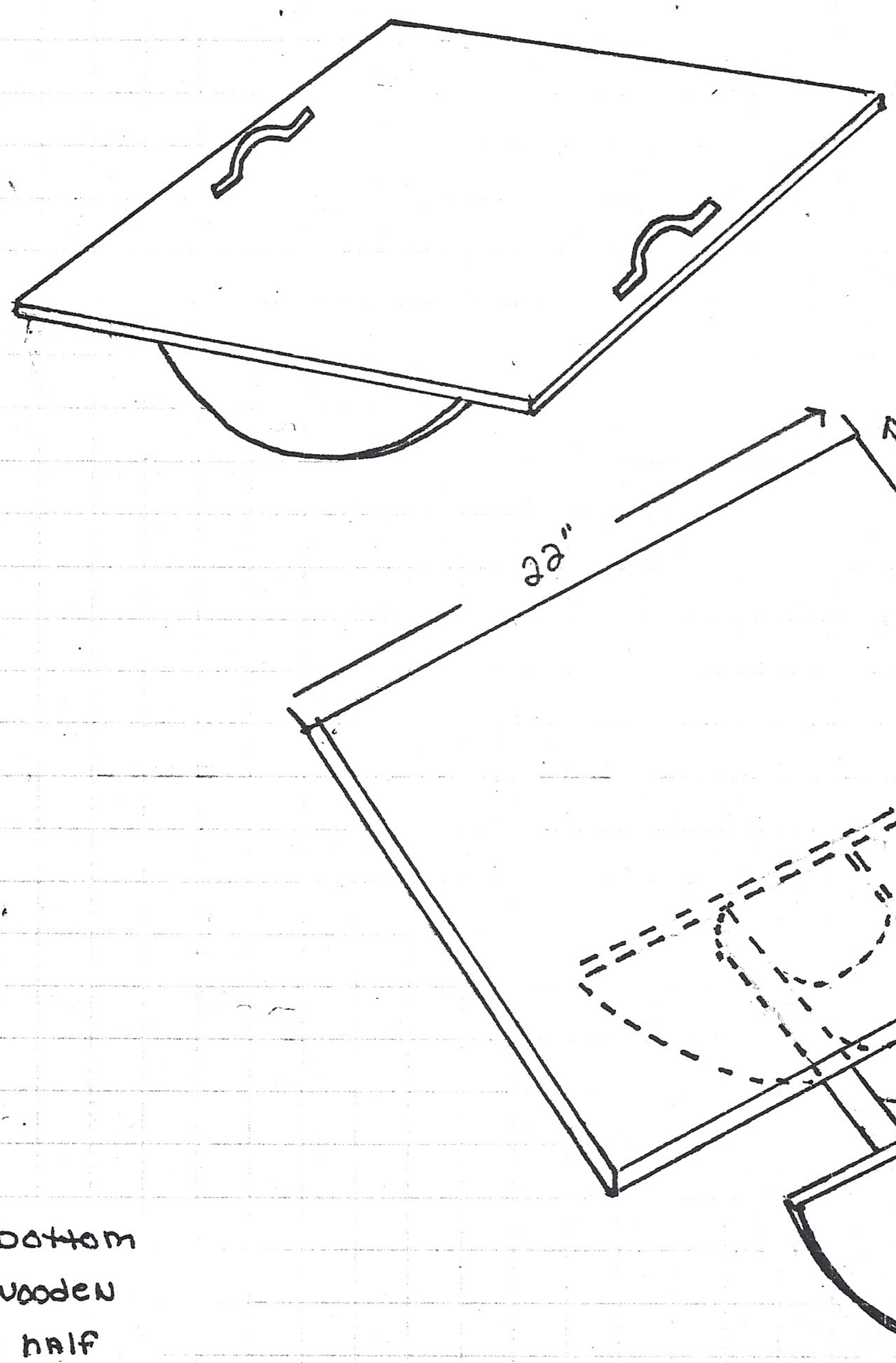
4. Attach spool to plywood using corner brackets (if screws protrude through the top side of the board, filing them down is recommended).

5. Attach the cabinet handles on either side of the board top. This may prevent the child from holding on to the sides of the board and pinched fingers.

6. Sanding rough edges should be done. Covering the top of the board with carpeting may also be done.

NOT DRAWN TO SCALE

Rocker Board



Rockers ON bottom made From wooden spool CUT in half

T - STOOL

1) To facilitate righting, equilibrium, and balance reations in sitting position.
2) To enable weight bearing and weight shifting in the lower extremities.
3) To stimulate trunk rotation.
4) To allow for availability of T-Stool at a nominal cost and with easy construction.

Precautions and Considerations:

1) Place mat behind the student for protection in case of falling.
2) Take precautions to keep child from falling off the stool.
3) Do not leave the student unattended on T-Stool.
4) Try to incorporate games into activity to divert attention.

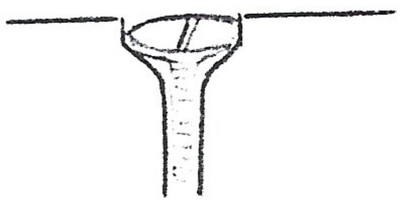
Supplies: 2 pieces wood 12" X 2" X 4"
3 - 4" screws
varnish

Estimated Cost: $1.00

Directions:

1. Center 1 of the 2" X 4" on top of the other as indicated in diagram.
2. Mark holes for screws where indicated in diagram.
3. Drill holes, countersink screws (make the top of the holes large enough to accomodate screw head):

(screw head is even with surface)

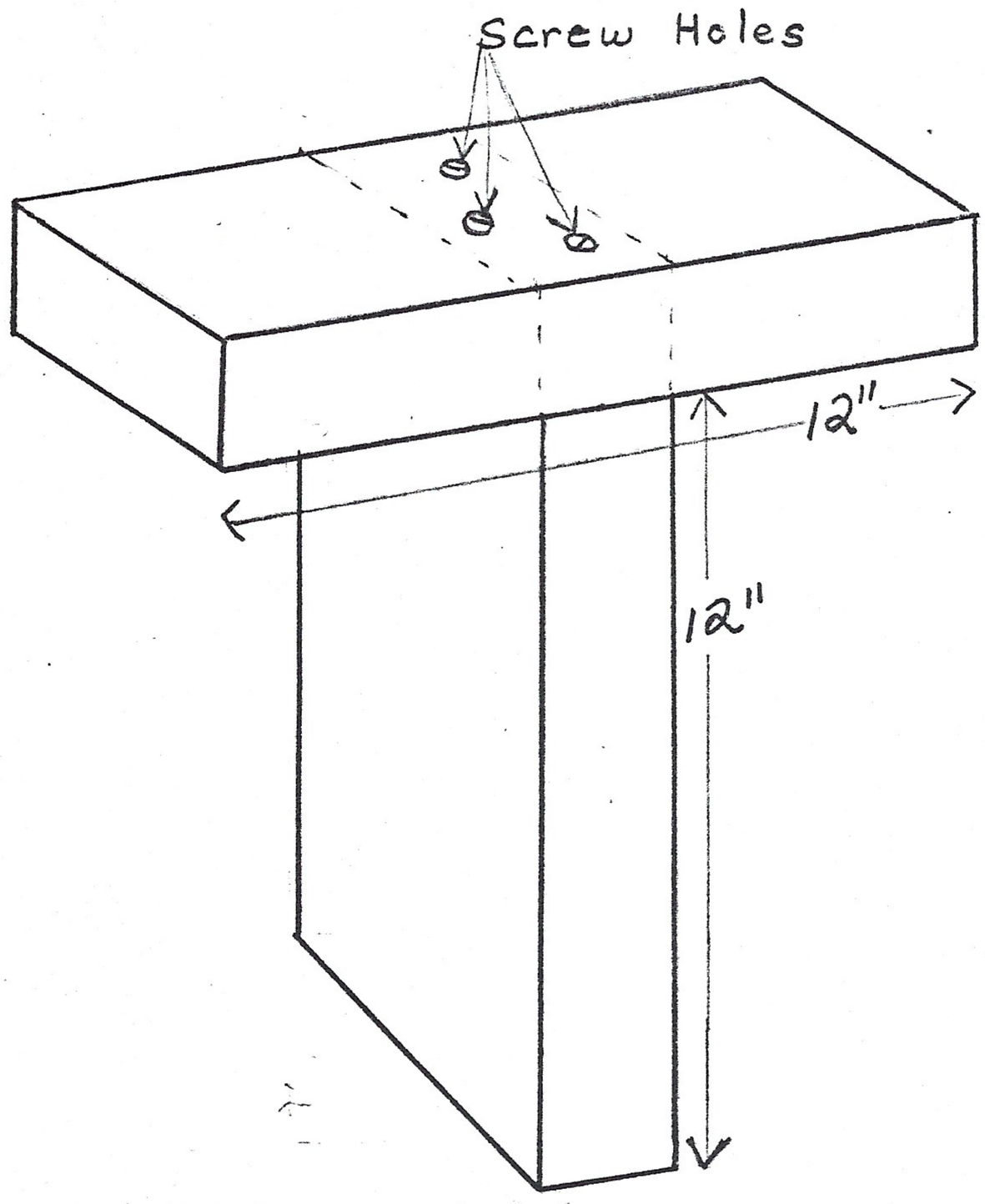


4. Sand, varnish.

Adjusting T-Stool:

1. The height of the stool can be varied by cutting the leg longer or shorter.
2. The T-Stool can require more balance to sit on by cutting the leg on an angle.

T- Stool



drawn to scale

1/4" = 1"

STILTS - COFFEE CANS

STILTS - COFFEE CAN

1) To facilitate equilibrium and balance reations in standing.

2) To allow for availability of stilts at nominal cost and minimal construction time.

Precautions and Considerations:

1) Do not leave student unattended on stilts.

2) Take precautions to keep child from falling off the stilts.

Supplies: 2 - 3 lb. coffee cans
carpet
floor adhesive
rope
2" mending date

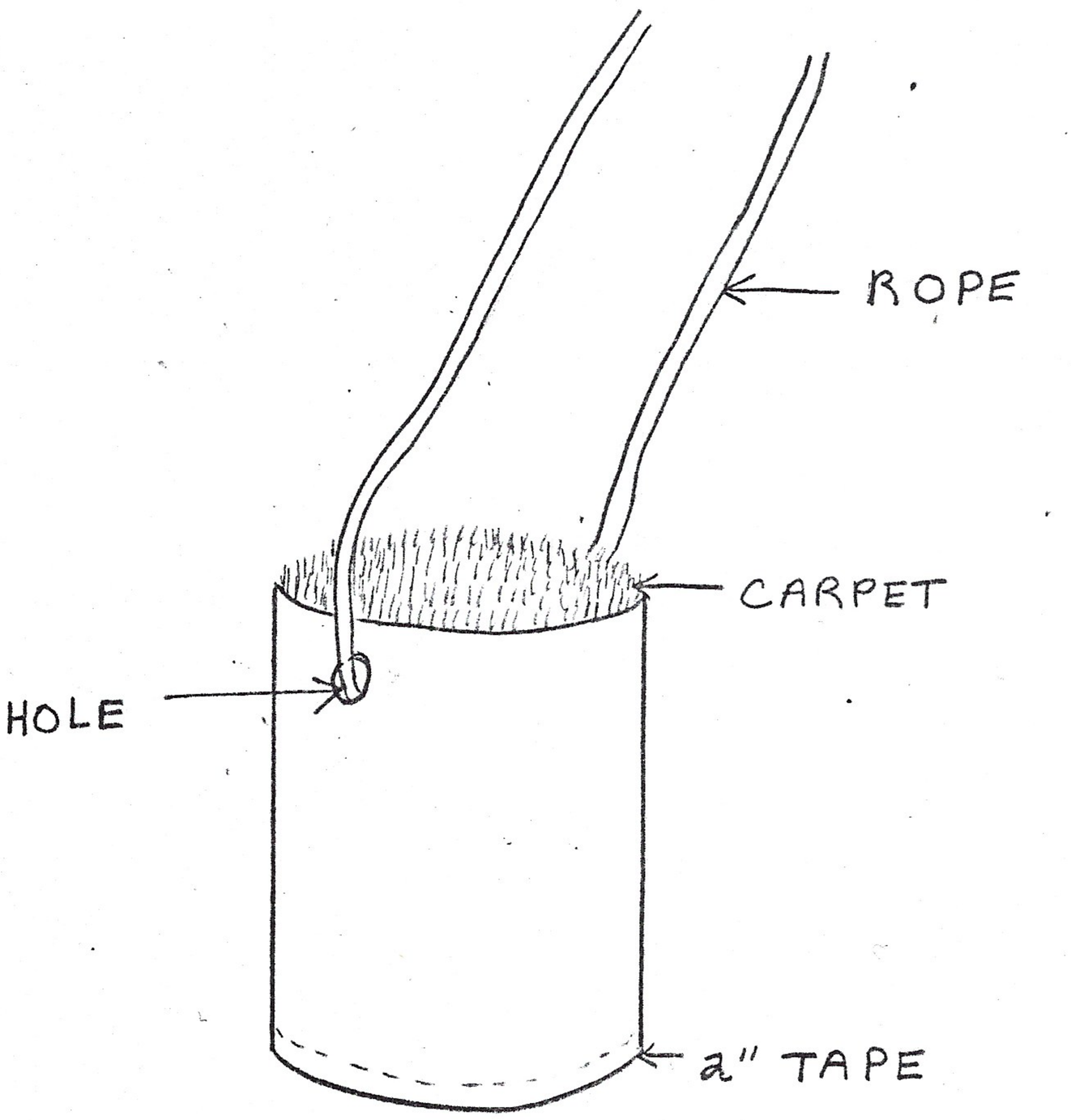
Estimated Cost: $1.00

1. Drill or punch holes for rope near top of coffee can.

2. File or tape any sharp edges, including around rim of can.

3. Cut carpet circles to fit top of can. Glue in place with floor adhesive.

4. Place rope through holes, cut to length (both ends hip to waist high). Tie knots.



MAKE 2

Stilts - Coffee Can

not drawn

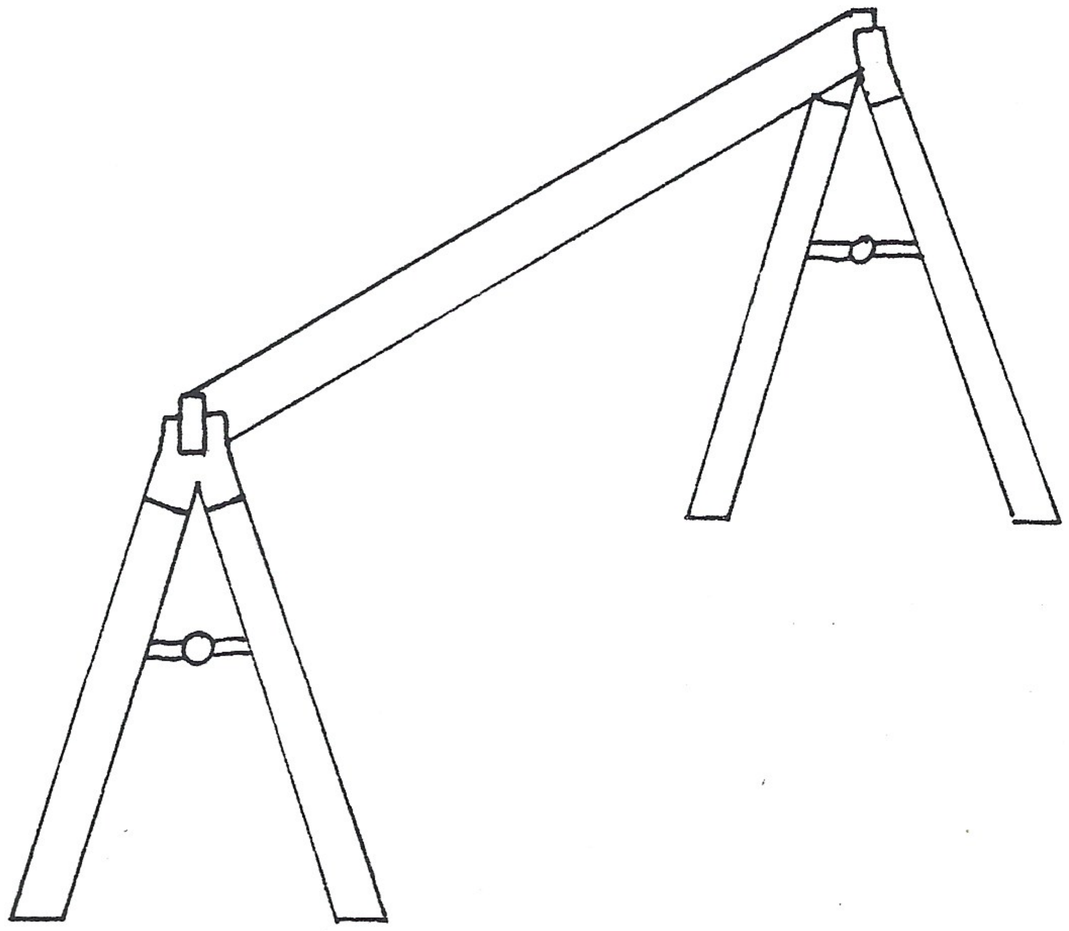
to scale

HAMMOCK FRAME

1) To provide vestibular stimulation in all planes.
2) To facilitate integration of tonic labyrinthine reflexes.
3) To facilitate righting, equilibrium, and balance reactions in the prone, supine, sitting, 4 point positions.
4) To increase head and trunk control.
5) To enhance relaxation in spastic or hyperactive children.
6) To increase muscle tone and general state of awareness.
7) To allow for availability of hammock for treatment without having to anchor into ceiling or wall.
8) To allow for portability of hammock frame.
9) To allow for use in small spaces.
10) To provide a hammock frame at nominal cost and ease in construction.
11) To provide versatility to the hammock (tire swing, platform, etc.).

Precautions and Considerations:

1) Do not swing or spin child hard, as frame could fall.
2) Do not leave student unattended on frame, as he could topple the frame or another student in class could push it over.
3) Take precautions to keep student from falling out of or off apparatus.
4) Be aware of overstimulating or overinhibiting the student: be watchful for extreme fearfulness, pallor, hyperventilation, perspiration, sudden drowsiness, or dizziness.
5) Do <u>not</u> spin a child with seizures or suspected seizure activity.



HAMMOCK FRAME

Supplies: 4 pieces wood 54 3/4" X 2" X 4"
1 piece wood 68½" X 2" X 4"
2 sawhorse brackets (do not recommend cheap brackets)
2 table leg support hinges
2 mending plates 2" X 10"
3 hooks

Estimated Cost: $15.00

Directions:

1. Place the 54 3/4" legs in sawhorse brackets.

2. Place 68½" center bar across brackets.

3. Make diagonal cuts on bottom of legs so it sits flat on floor.

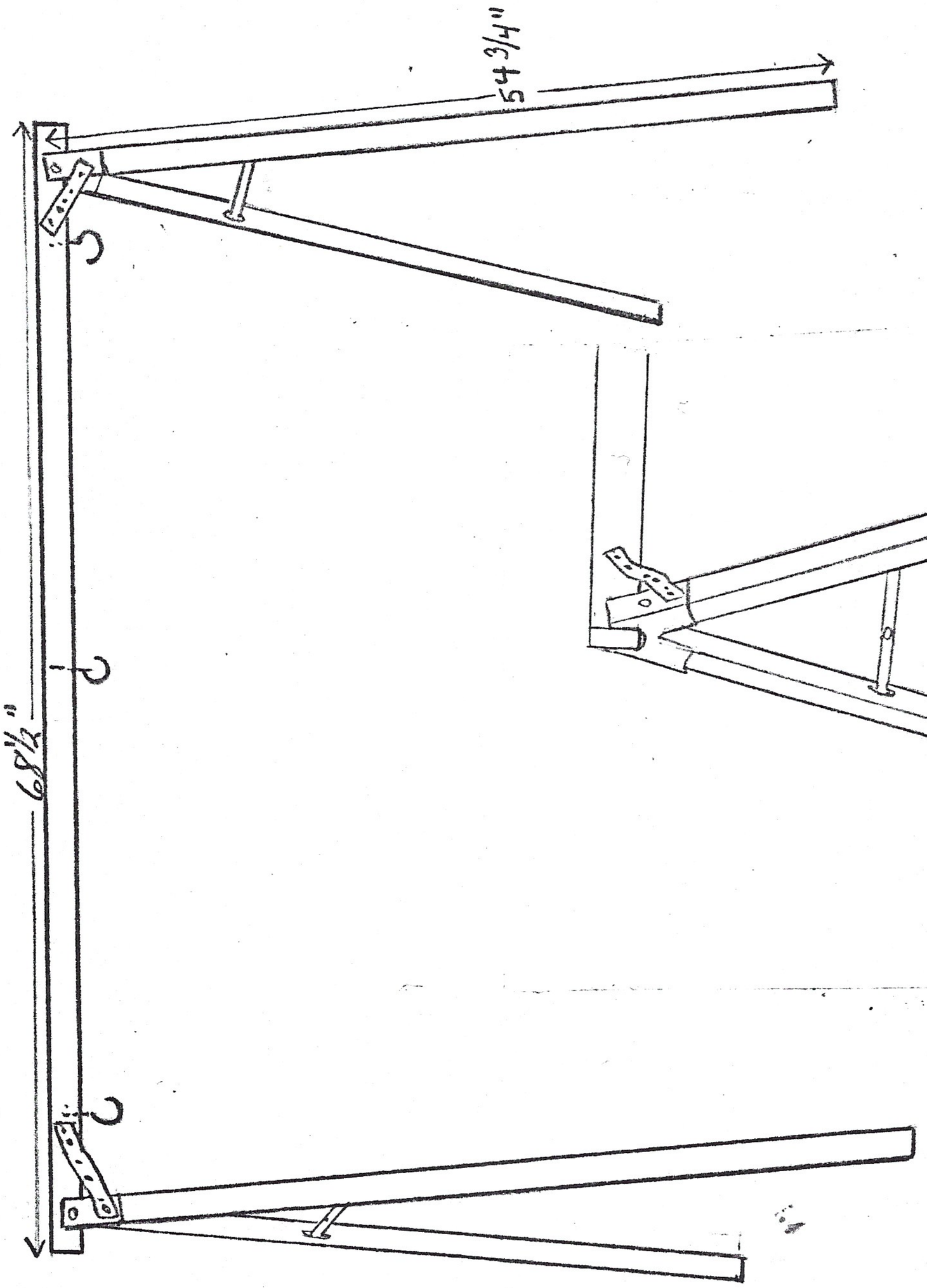
4. Attach table leg support hinges as indicated on diagram. Make sure you can fold legs before attaching permanently.

5. Attach mending plates as indicated on drawing. To allow frame to fold, mending plates should be on the same side.

   Note: If possible, bend mending plate so that it curves from leg into center bar. Bend by hammering it across metal.

6. Place hooks as indicated in drawing.

7. Sand, varnish.


54 3/4"
68 1/2"

TOY BAR

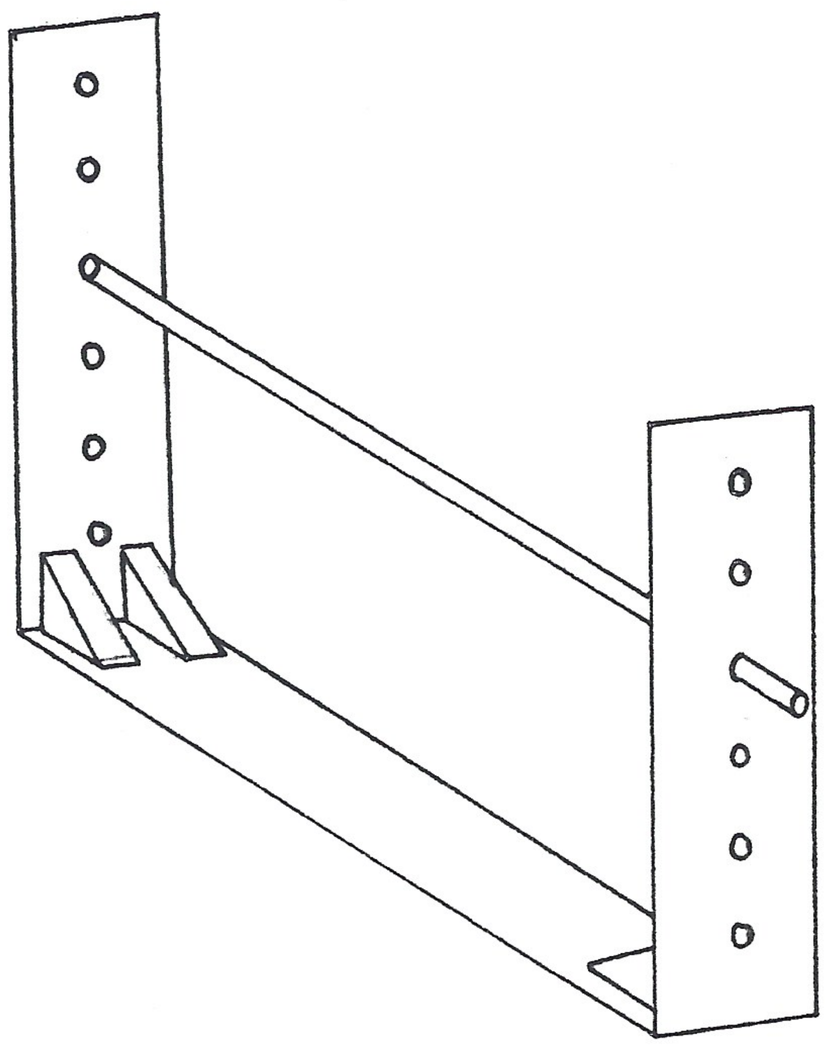
1) To keep toys within reach and visual range of child while prone or supine.

2) To provide visual stimulation.

Precautions and Considerations:

1) Experiment to find toys appealing to child.

2) Keep toy bar stabilized to prevent falling on child.



TOY BAR

Supplies: 1" dowel rod
wood
screws
nails

Estimated Cost: 1" dowel rod - $1
wood - $4
screws - expendible
nails - expendible

Total Cost = $5.00

Directions:

1. Cut wood pieces to desired length and height. Width of the base should be wide enough to prevent tipping.

2. Measure notches on bottom edge of sides - approximately 2" high X 2" wide.

3. Cut out ends with a saber saw.

4. Measure notches for bottom board and cut out. *Correct measurements are imperative to insure a perfect fit.

5. The sides can then be nailed or screwed to the base.

6. Additional corner supports may be needed to prevent the sides from pulling apart from the base. These can be made from wood or corner brackets.

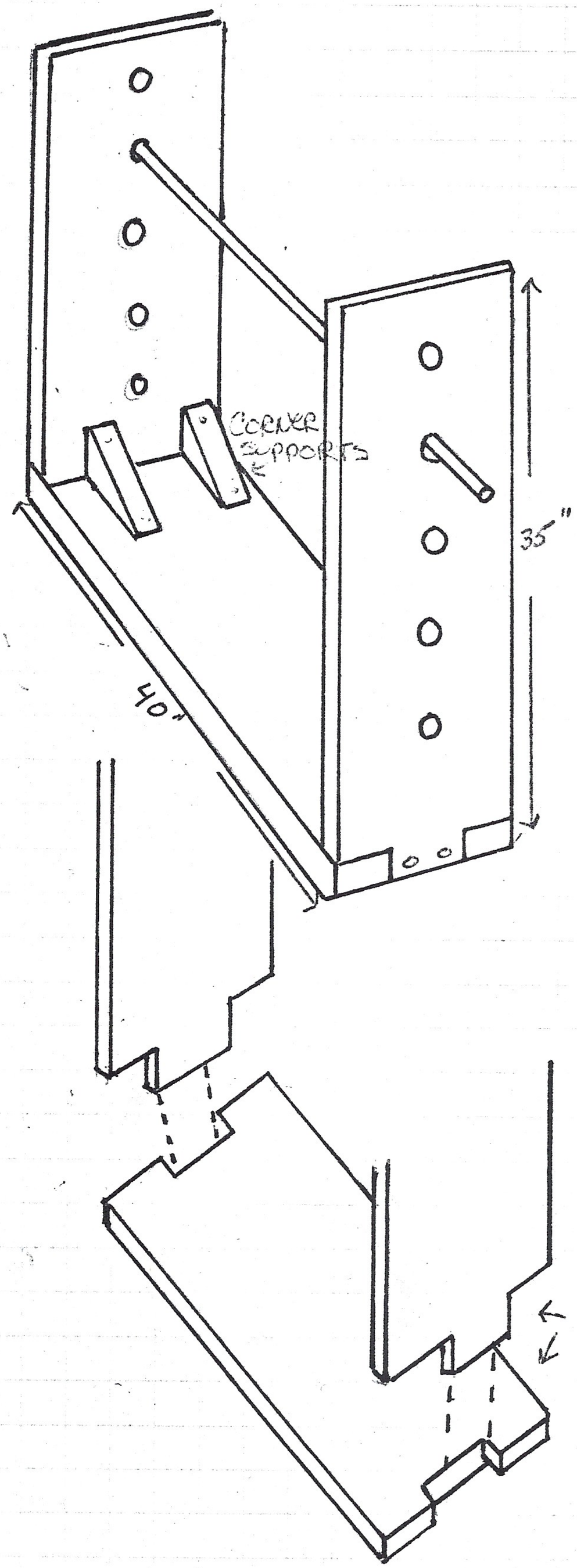
7. Measure where holes for the dowel rod is desired. *Care should be taken when measuring and drilling holes to make sure the bar is level.

8. Size of holes should exceed the size of the dowel rod for easy sliding when changing heights.

9. Sand rough edges and paint, if desired.

NOT DRAWN TO SCALE

Toy Bar



EQUIPMENT TO MEET SPECIFIC OBJECTIVES FOR SPECIFIC CHILDREN

CHAIRS AND TABLES

a. A Corner Chair and Table

1) To provide for optimal sitting position.

2) To provide trunk support.

3) To facilitate back extension and body symmetry.

4) To allow more functional arm movements.

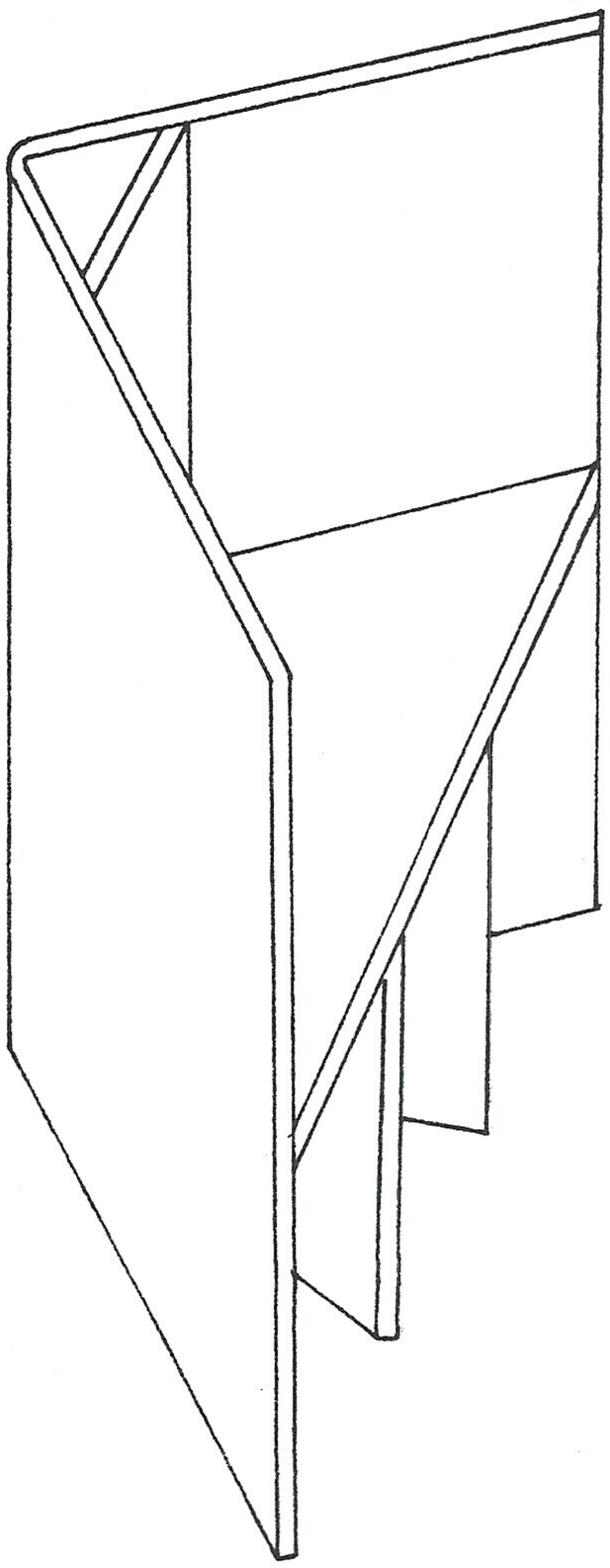
Precautions and Considerations:

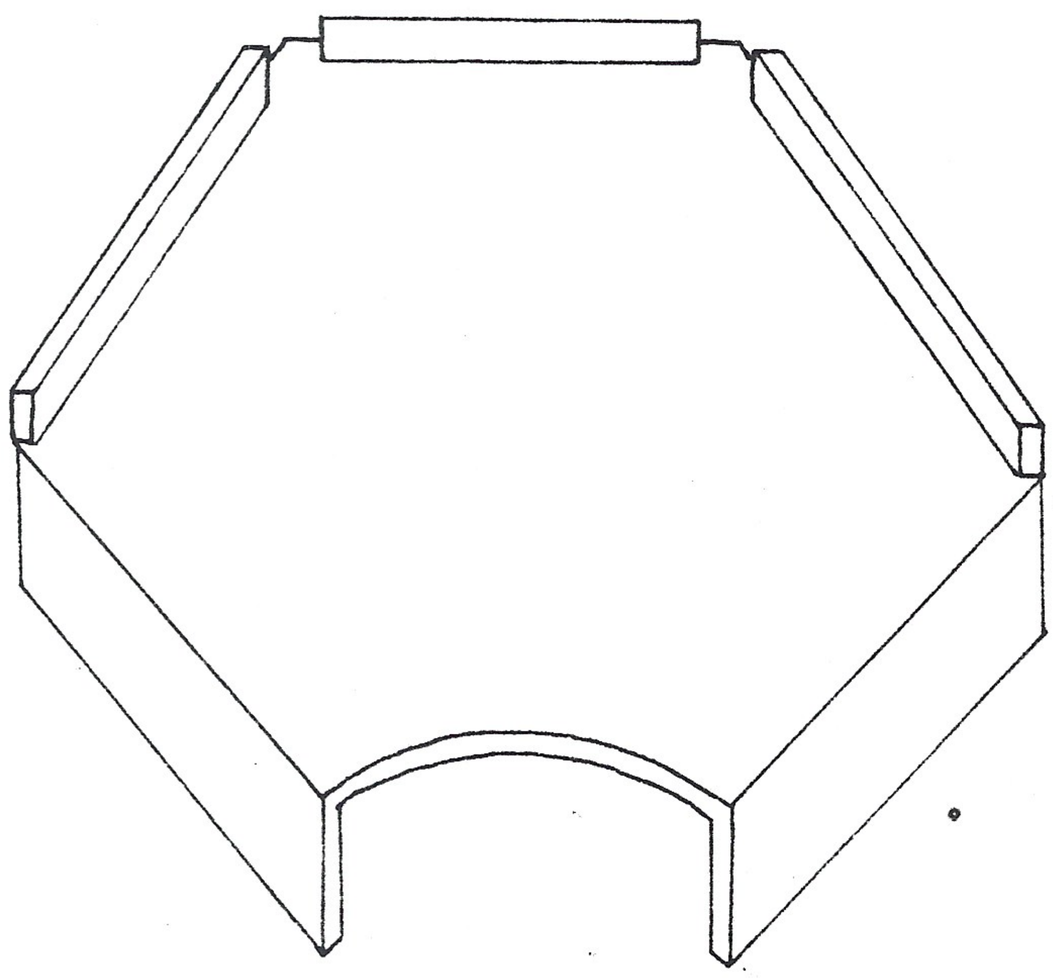
1) Keep the seat belt fastened to prevent student from falling.

2) Do not leave student in chair for more than 30 minutes ideally, and, at the most, 1 hour.

3) Each child needs to be evaluated and measured very carefully to ensure proper fit and to adequately meet each child's individual needs.

4) Pressure points need to be checked in order to prevent skin breakdown (student may have to build up tolerance to use of chair).





CORNER CHAIR - VERSION 1

Supplies: Tri-wall
white glue
2" gummed tape
paint
webbing
Velcro
"D" ring

Estimated Cost: $6.50

Directions:

1. Cut pieces: 1 A; 1 B; 1 C; 2 D; 2 E. The slots in piece C are cut at an angle.
2. Piece A: At center, score (make a diagonal cut through top two layers of cardboard only).

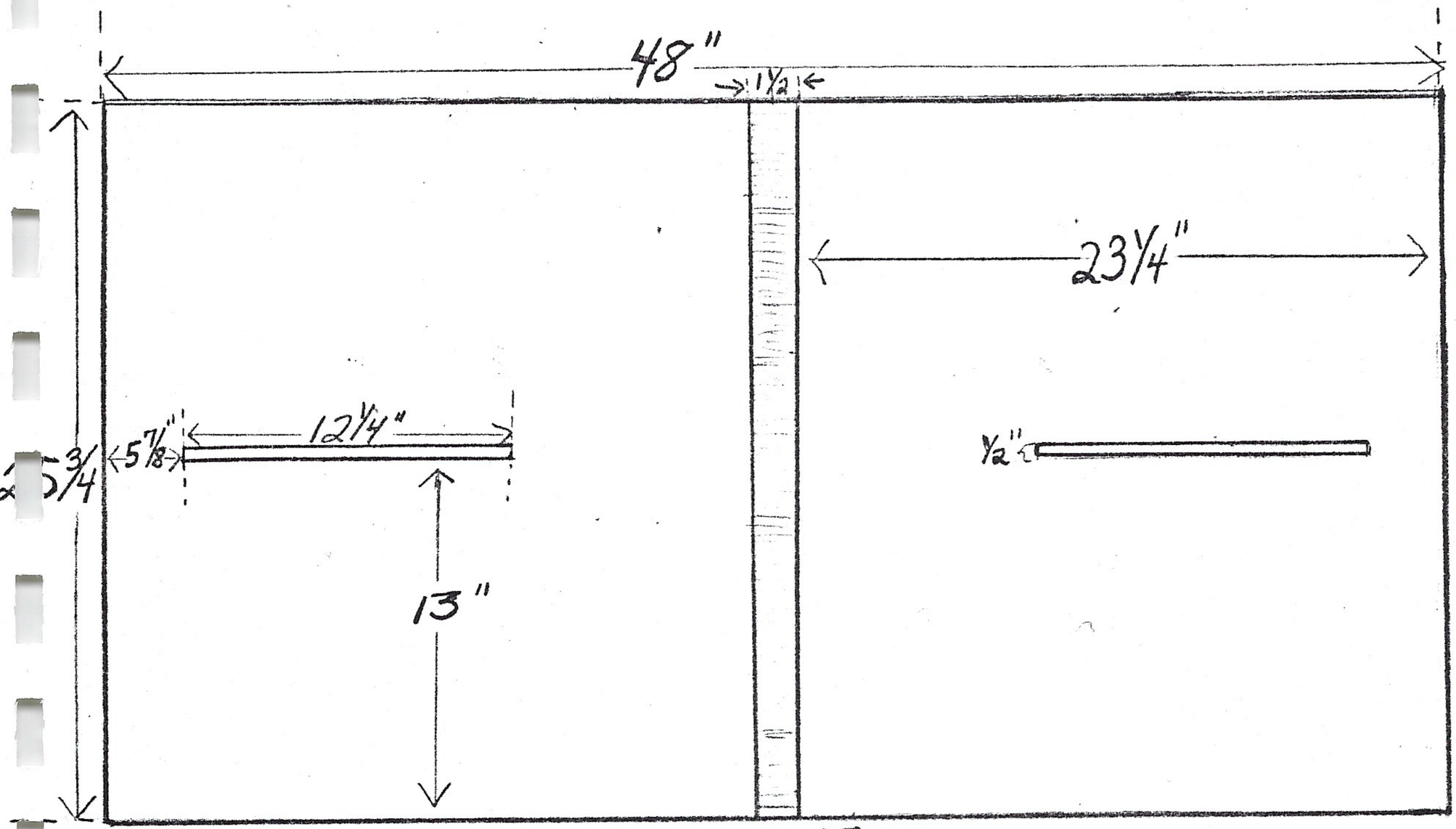
   After scoring, fold to 90° angle. Tape.
3. Place tongues of piece B in slots of piece A. Place pieces E on tongues of B. Glue and tape joints.
4. Place C (back of chair) through 6" slot of B: tape joint.
5. Place 6½" tongues in slots of C, at same time placing 2½" slots of B. Tape joints.
6. Make narrow slots 8¼" from front of chair for seat belt. Use webbing, Velcro, and D-ring to make safety belt. Place through slot and under chair and up through other slot.
7. Paint.

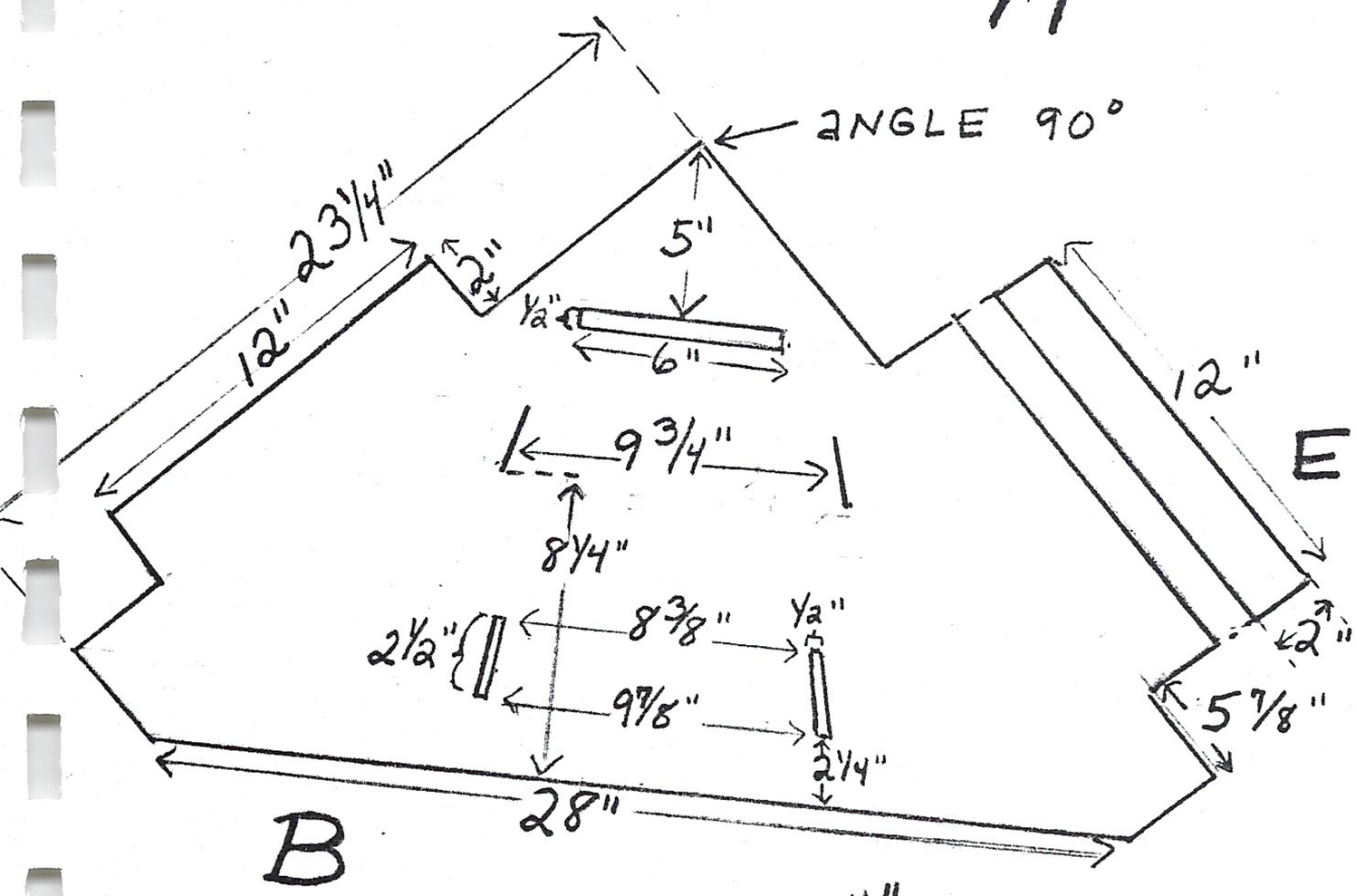
Adjusting for Other Children:

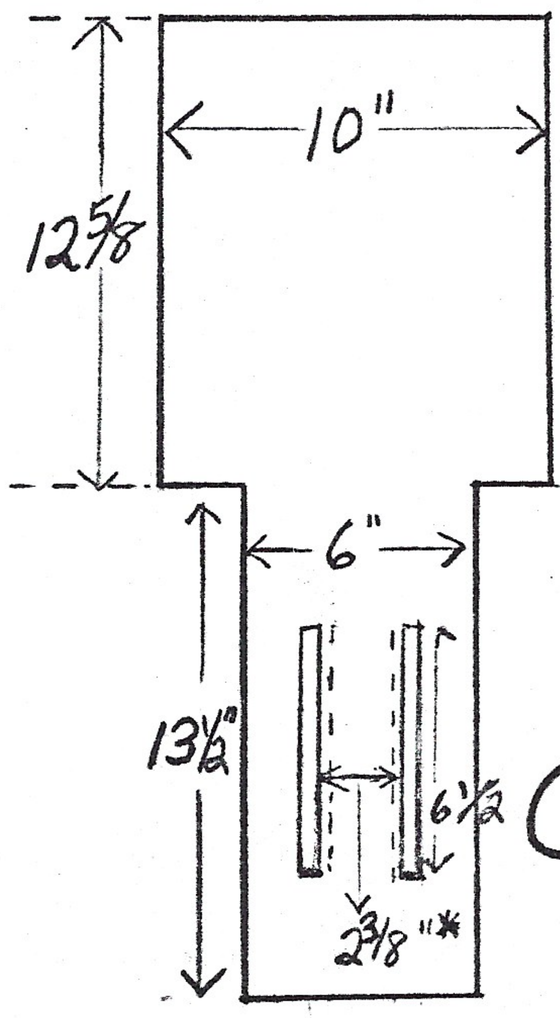
1. The height of A is determined by measuring child from floor to shoulder while he/she is seated in a chair with hips and knees at 90° and feet on the floor.
2. The height of slots on pieces A and the height of D is determined by measuring the child from front to back of knee.
3. The depth of B (front to slot for C) is determined by measuring the child from back of knee to back of hip.
4. Width of upper portion of C is determined by measuring width of child's shoulders. Place slot in B (for C to fit into) as far back into corner as possible (my measurement was 5").
5. Width of slot for seat belt is determined by measuring from hip to hip.

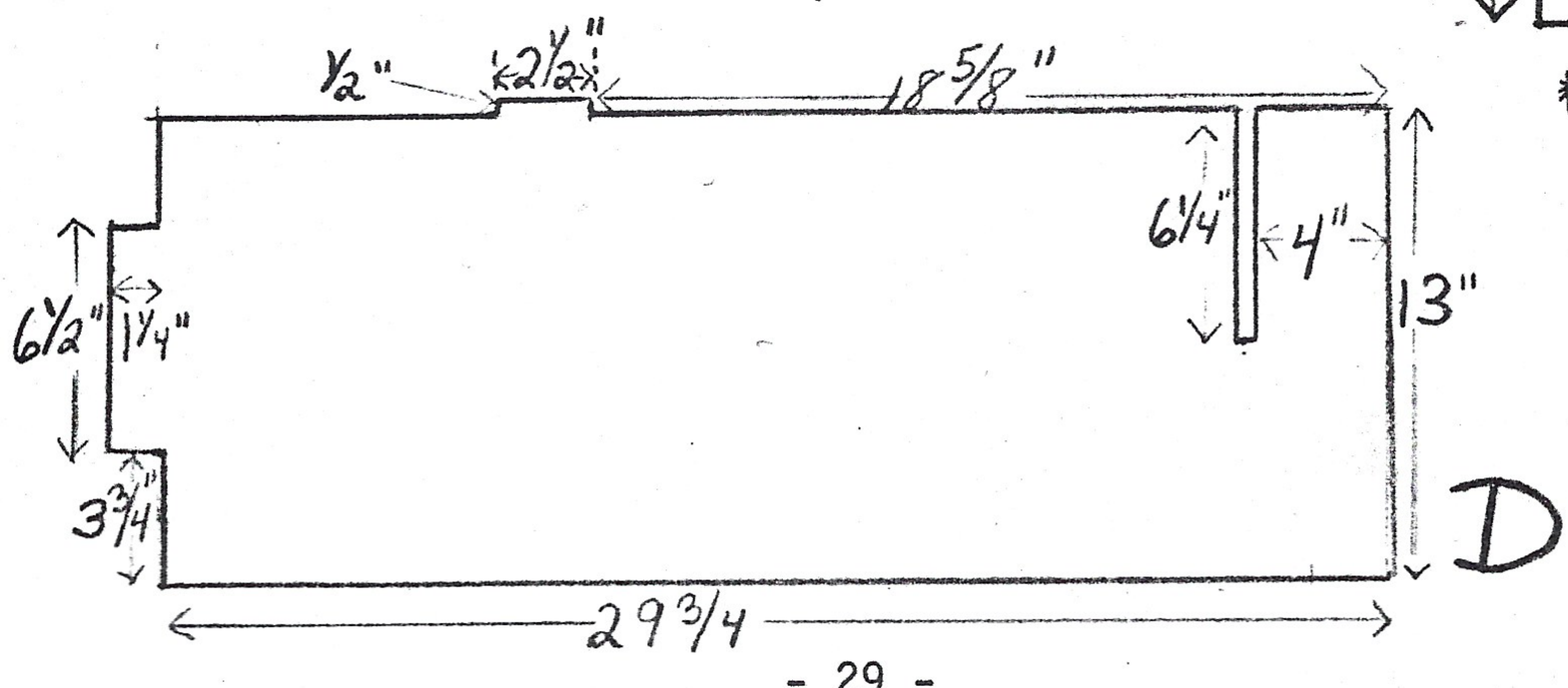
Corner Chair

drawn to scale









*2 1/8 on other side of Tri-wall (angle cut)

CORNER CHAIR TABLETOP

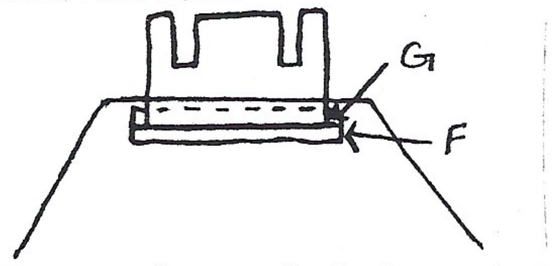
Supplies: Tri-wall
white glue
2" wide gummed tape
paint (donated)

Estimated Cost: $3.00

Directions:

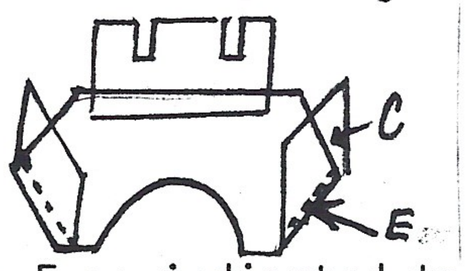
1. Cut 1 A; 1 B; 2 C; 2 D; 2 E; 2 F; 2 G.

2. Place tab 1 (A) in slot 1 (B). On underside of B, glue G and F as indicated:



Tape along joints edges.

3. Place C on edge of the underside of B.



Glue E as indicated to support C. Tape joint edges.

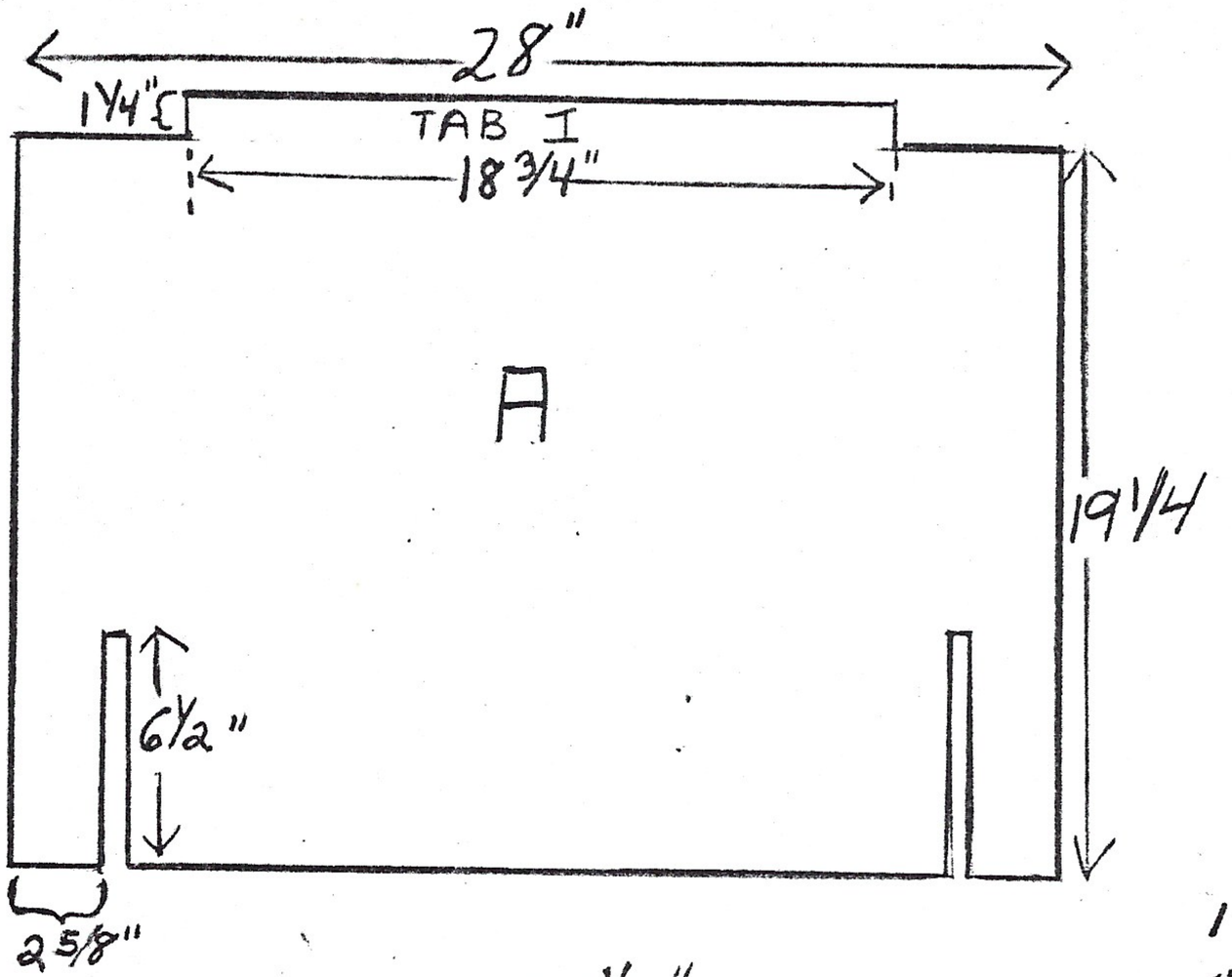
4. On top of B, glue D as indicated on plans (serves as edge on table top). Tape joint edges.

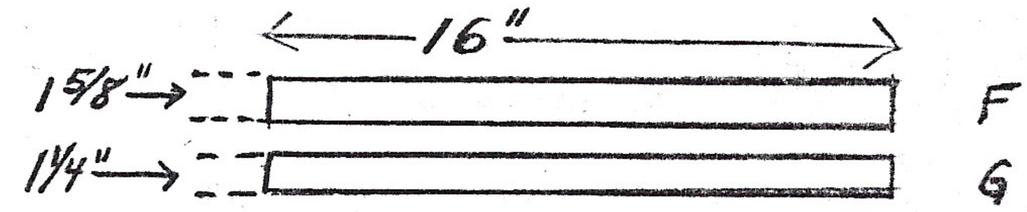
5. Paint with water resistent paint (paint both sides at same time to prevent warping).

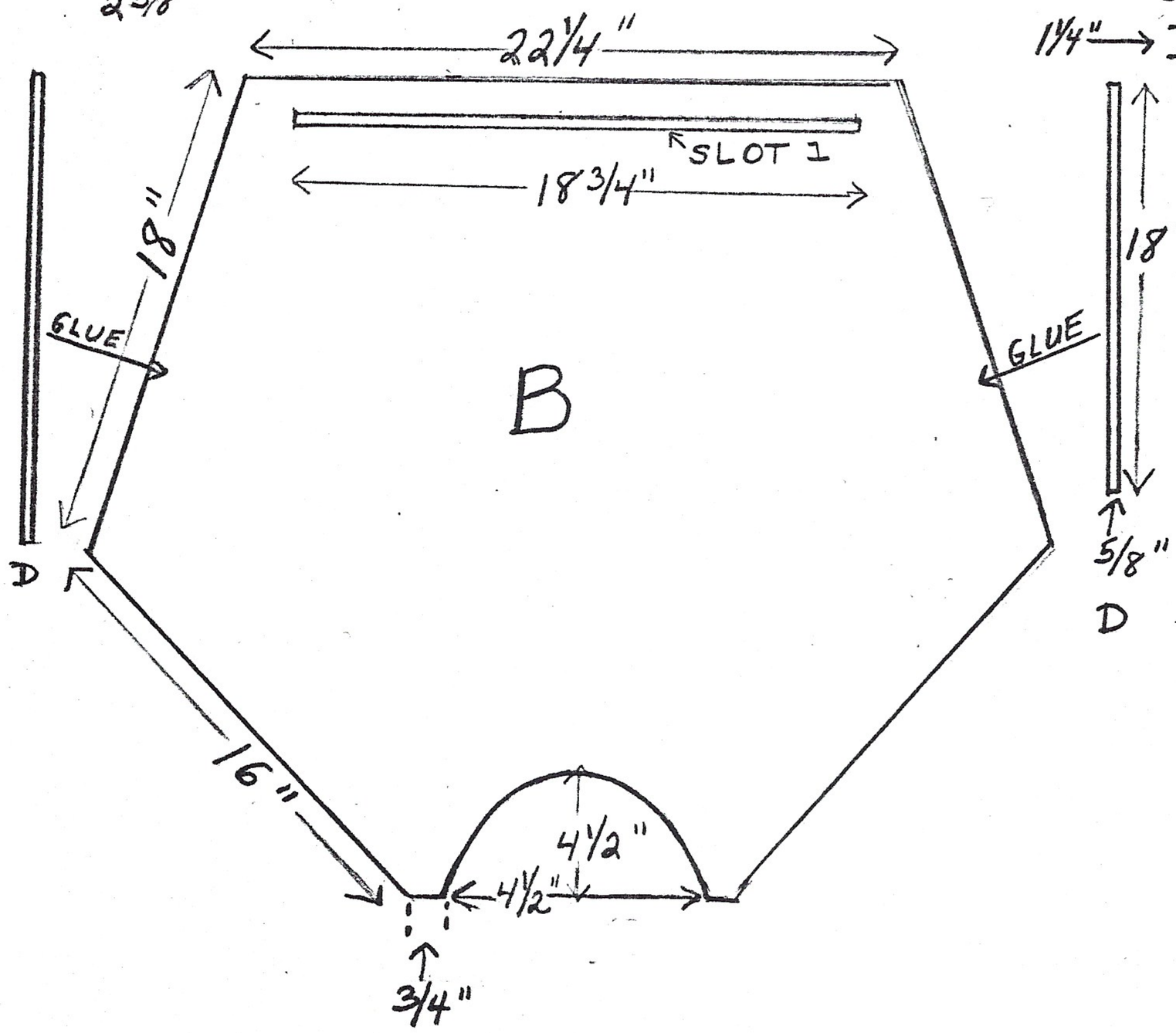
To Adjust for Other Children:

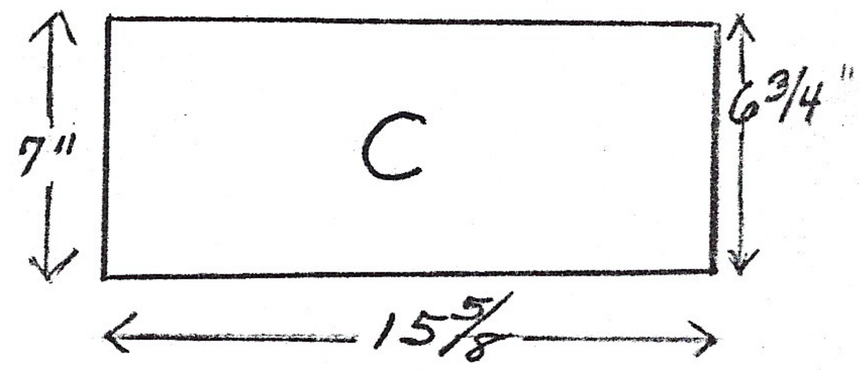
1. A and C: The height of C is determined by measuring child from chair seat to waist. The height of A is determined by measuring from floor to child's waist (while sitting in chair).

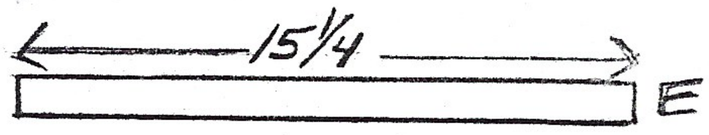
2. B: The halfcircle cut-out needs to fit around child's waist. Make a paper pattern and fit around the child's waist.











Corner Chair Table

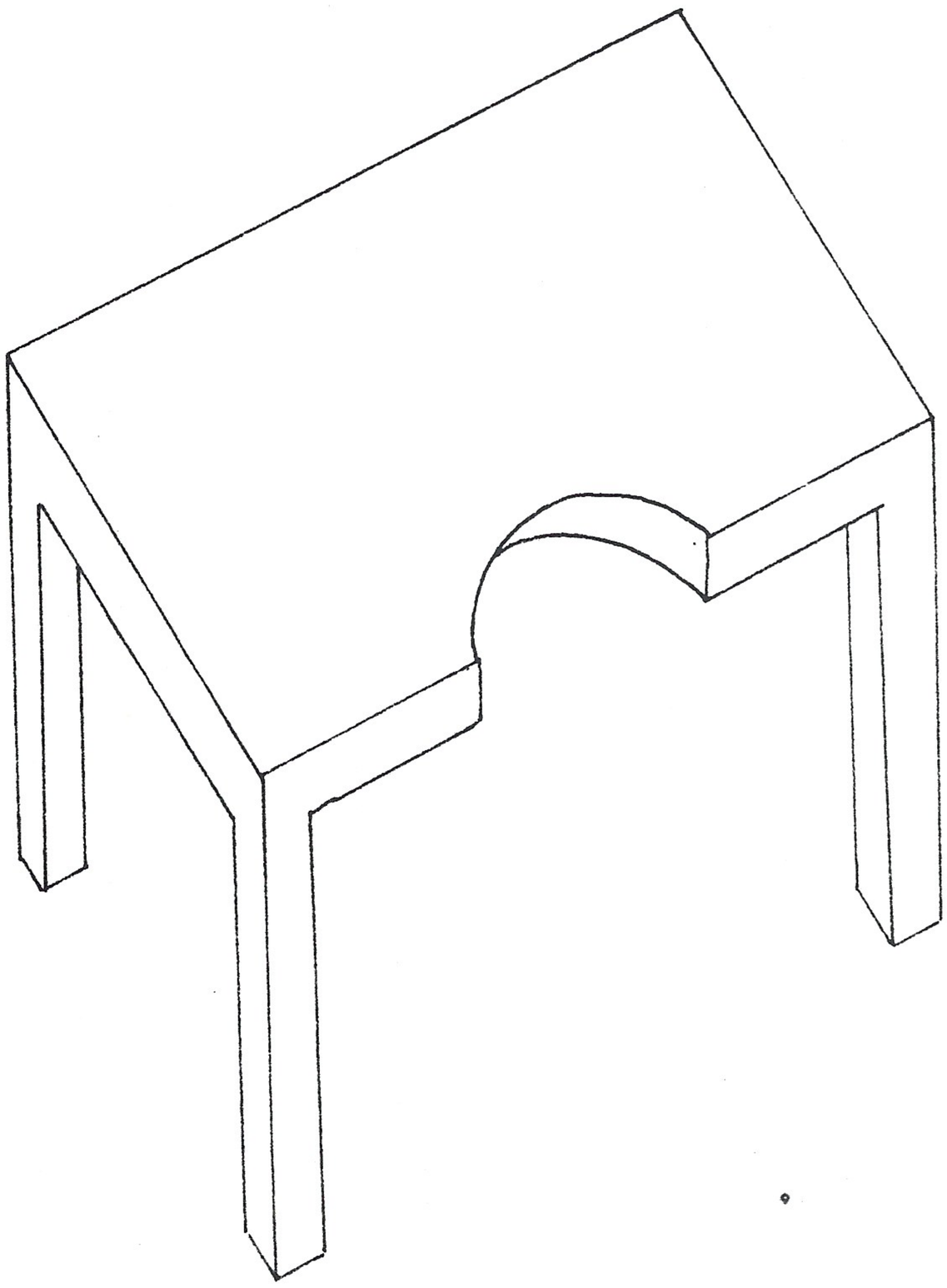
drawn to scale

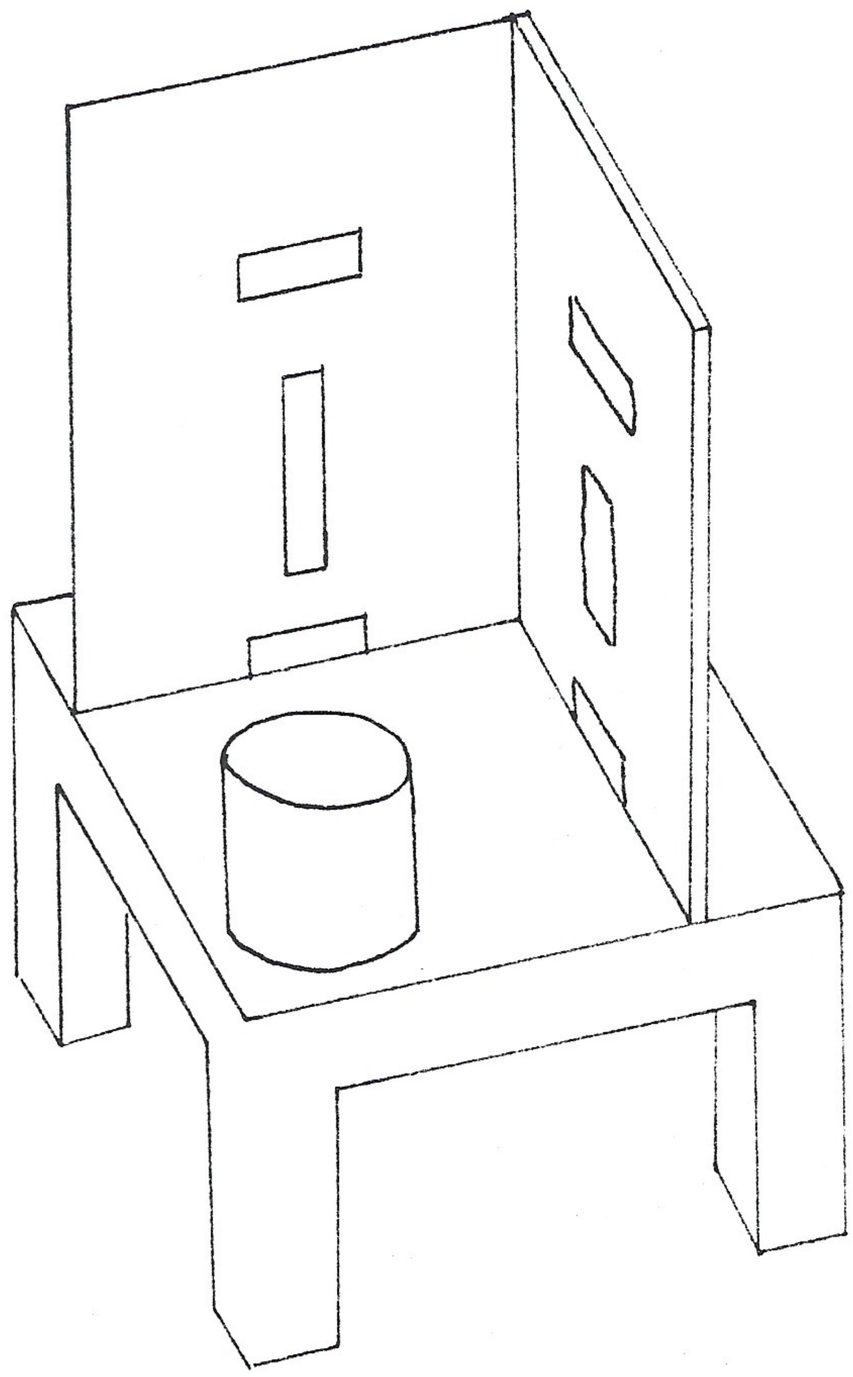
CORNER CHAIR - VERSION 2

1) Provide desired sitting position with head and trunk supported.
2) Abductor - to assist in preventing extensor thrust.
3) Holes in back of chair in designated places for use of straps (if desired) to assist trunk support.

Table

1) Provide surface for play
2) Offer additional trunk support.





CORNER CHAIR - VERSION 2

Supplies: ½" plywood
2"X4" board
coffee can
screws
nails
1"X1" stick
corner brackets

Estimated Cost: ½" plywood - $5
2"X4" board - $3
coffee can - no cost
screws - expendible
nails - expendible
1"X1" stick - 50¢
corner brackets - $4

Total Cost = $12.50

Directions:

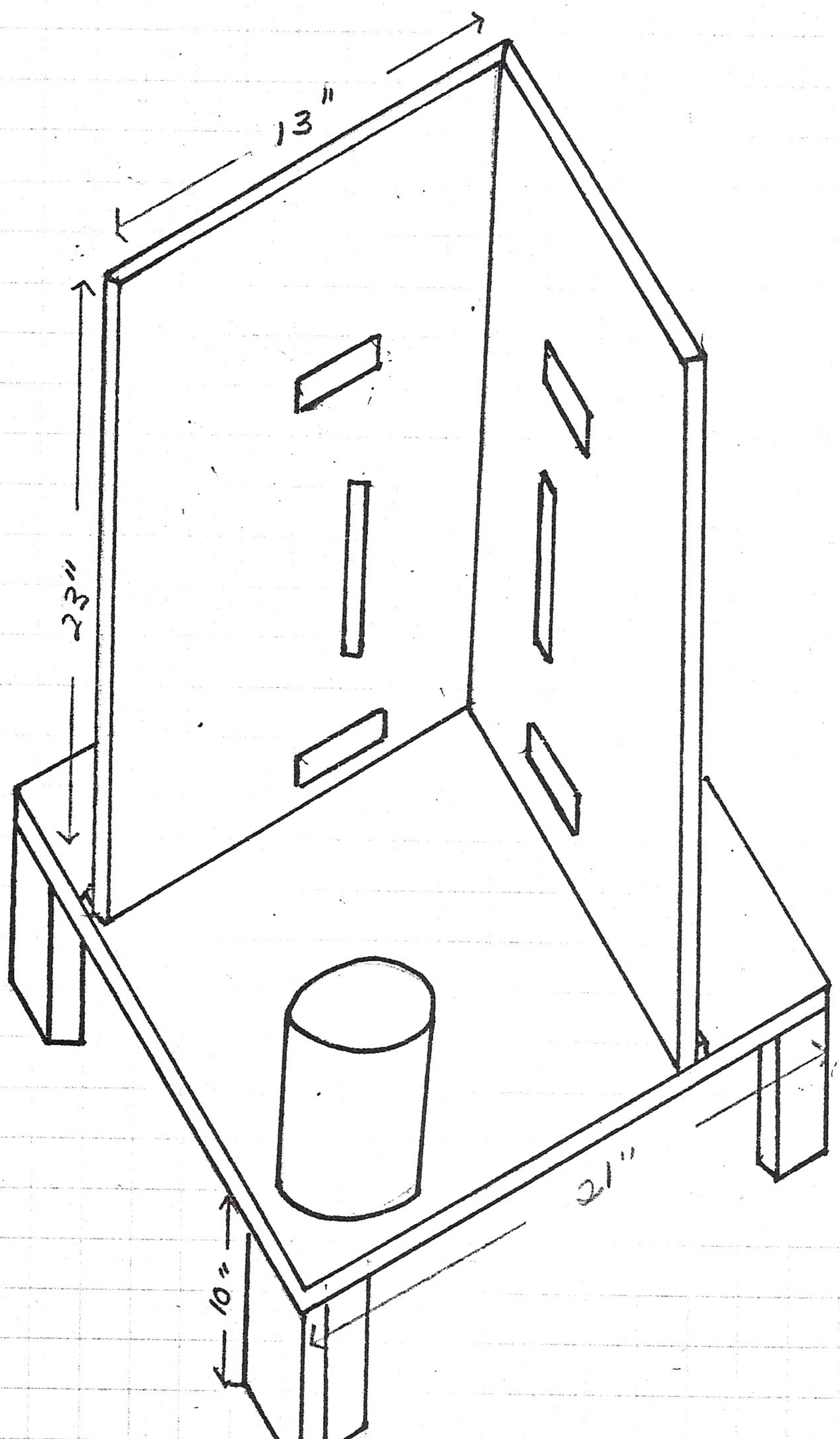
1. Child should be measured for seat depth and height of back of chair. Chair in the illustration measures 23" high, seat depth is approximately 18". The height of the seat from the ground must also custom fit the child so feet sit flat on the floor. The illustrated chair measures 10".
2. Cut out base of chair.
3. Cut 2" X 4" board desired height for legs.
4. Attach legs (of equal lengths) to the base using nails and screws. (Corner brackets may also be used.)
5. Cut plywood for the back of the chair.
6. Attach corners with corner brackets.
7. At this point, the child should be measured for placement of holes in back for use of straps. (Cut holes with Saber Saw.)
8. Cut 1" X 1" stick (2 pieces) length of sides of chair and secure to chair back (where back and seat join to reinforce joint) by nuts and bolts.
9. Secure chair back to the base (seat) of chair by using nuts and bolts.
10. Measure amount of abduction desired (a different size can may be needed). Comfort of the child is imperative.
11. Secure can to the chair base with at least two nuts and bolts.

Special Considerations:

1. Cushions may be needed for seat and back.
2. Chair should be well sanded or covered with vinyl to eliminate rough edges.

* NOT DRAWN to SCALE

CORNER CHAIR VERSION 2



TABLE

Supplies: wood
screws

Estimated Cost: $3.00

Directions:

1. Measure and cut table top to fit chair.

2. Half circle cut out is measured to fit around child's chest - Saber saw is used to cut this.

3. Desired height of legs must also be measured. Some children may require more trunk support than others, therefore, a higher table.

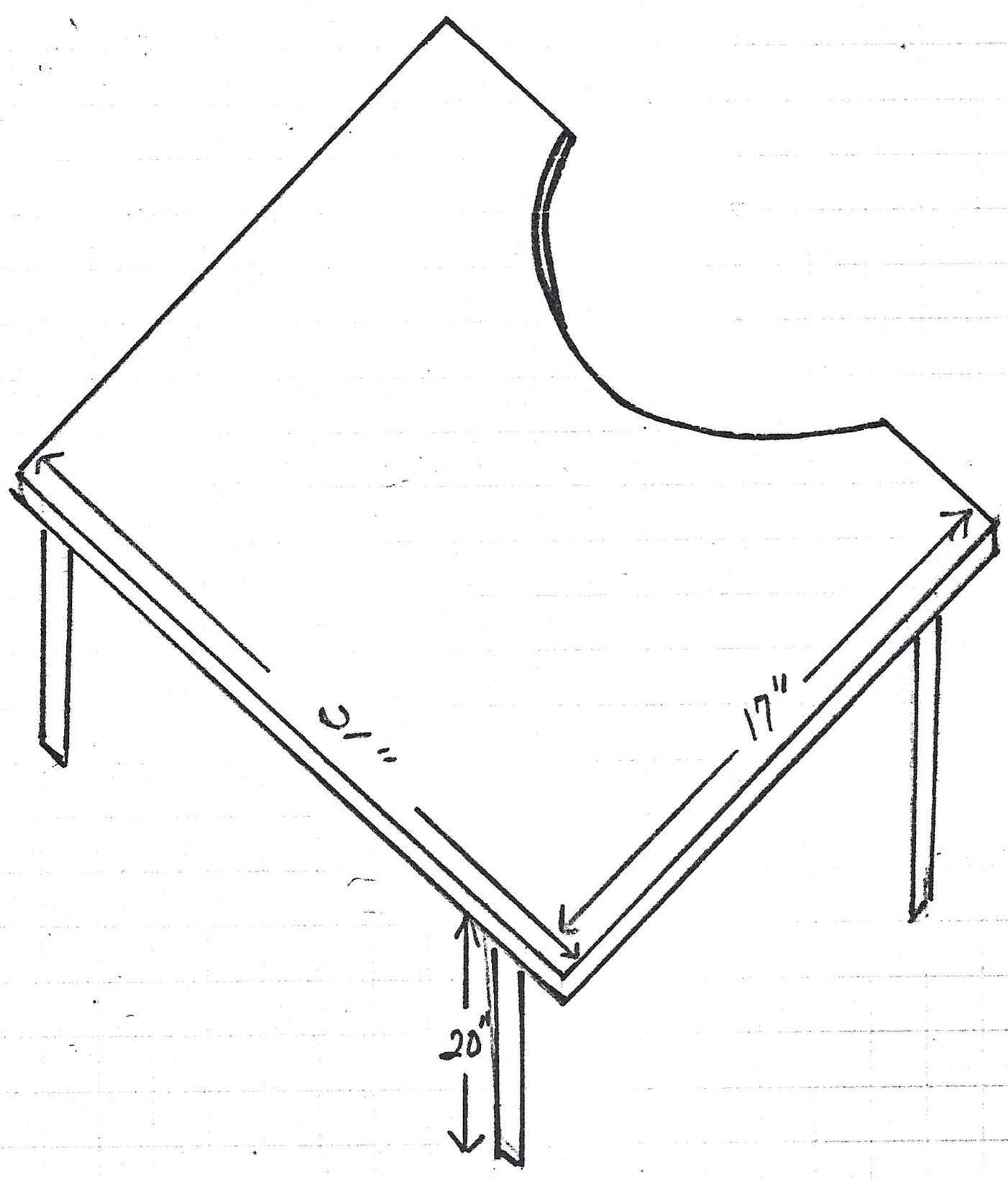
4. Secure legs to table top using screws. Screws go through top of table into legs.

5. Sand rough edges and paint, if desired.

6. Padding around the half circle cut out may need to be used, as this area may be uncomfortable for the child.

* NOT DRAWN TO SCALE

TABLE FOR CORNER CHAIR



BASIC CHAIR

1) To improve body symmetry.

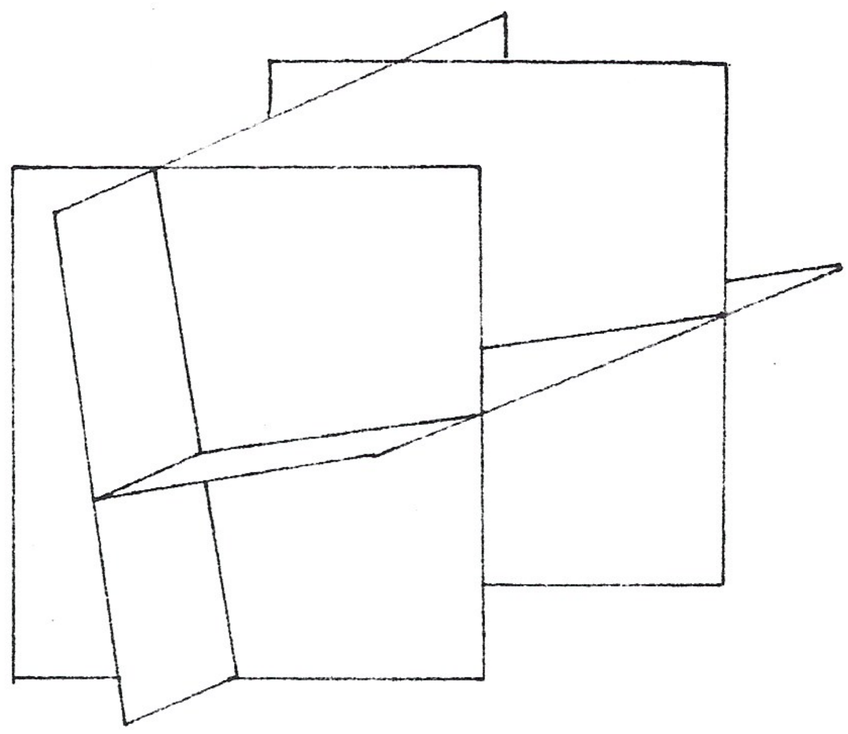
2) To provide trunk stability.

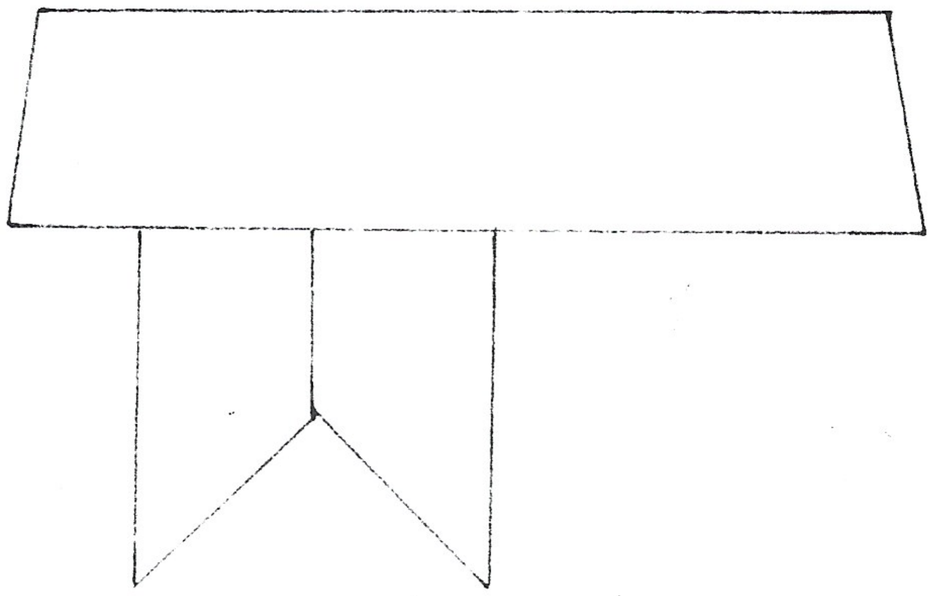
3) To improve head control in the upright position.

4) To provide positioning for use with feedback head control device and table (see page 23).

Table

1) To provide surface for use with chair and feedback head control device which will hold toy within child's visual field, but out of reach of hands.





CHAIR

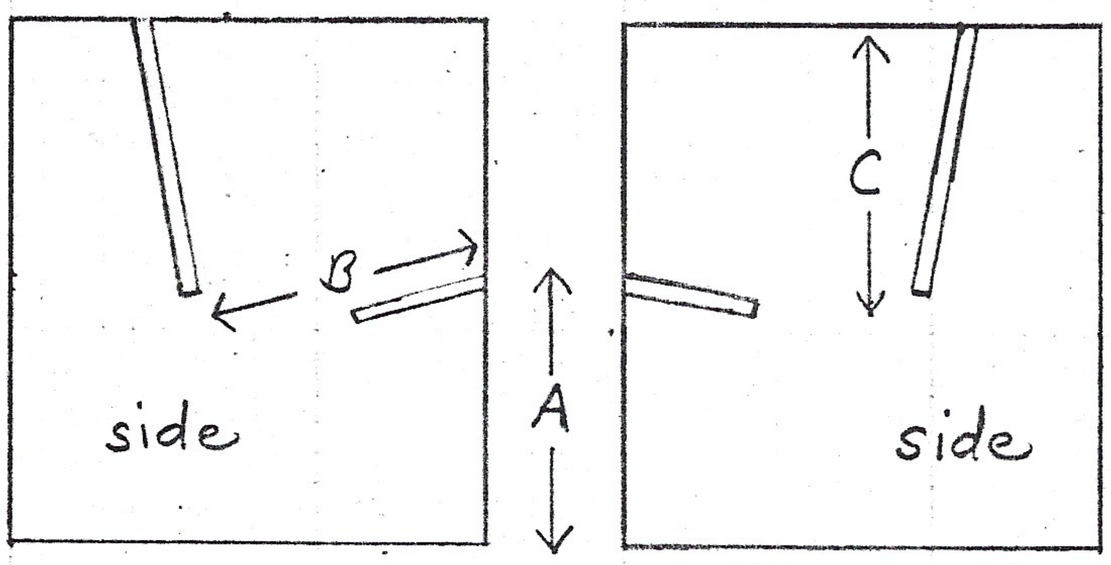
Supplies: Tri-wall - slot construction
2" gummed (paper) tape
glue for joints and vinyl
paint
vinyl or contact paper to waterproof seat

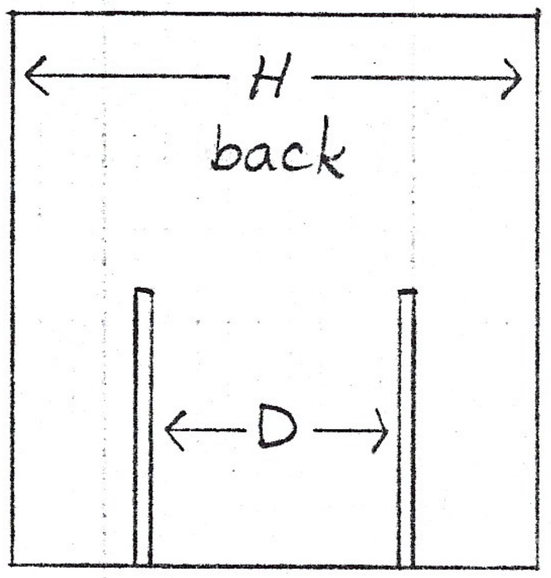
Estimated Cost: $4.00

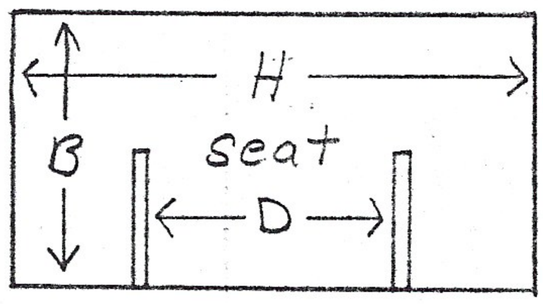
Directions:

1. Dimensions of chair are determined by size and needs of child, and do not have to be exactly as described here. Make a life size pattern to determine dimensions and to work from.
   A. Back of knee to heel.
   B. Back of knee to back.
   C. Seat to underarm.
   D. Hip width.
   E. Angle of seat to back is 90°.
   F. Tilt of seat and back is 10°.
   G. Seat slots in seat and sides are ½ of B.
   H. Allow ½" for each notch and 4 inches from notch to edge. (Width of seat and back pieces is D plus 9 inches.)
   I. Length of back and side pieces is determined by angle of tilt, so making a life size pattern is the easiest way to determine these dimensions.
   J. Back slots in back and sides are ½ of length of back.
2. Slide seat into sides and then back into sides.
3. Glue and tape joints and tape edges.
4. Paint all surfaces.
5. Use vinyl or contact paper to waterproof seats.

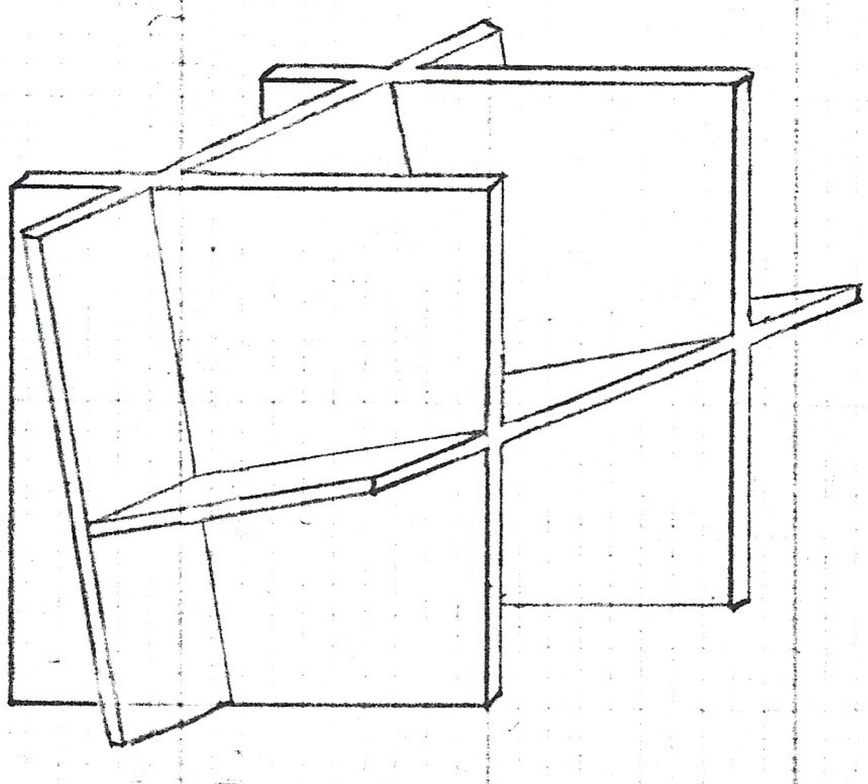
CHAIR







Tri Wall - Slot construction
Paper Tape for edges + joints
Glue for joints + vinyl
Paint
Vinyl to waterproof seat
Cost @ $4.00



TABLE

Supplies: Tri-wall - slot construction
2" gummed (paper) tape for edges and joints
glue for joints
paint

Estimated Cost: $3.00

Directions:

1. Table was made to rest on sides of chair, so size is determined by size of chair.

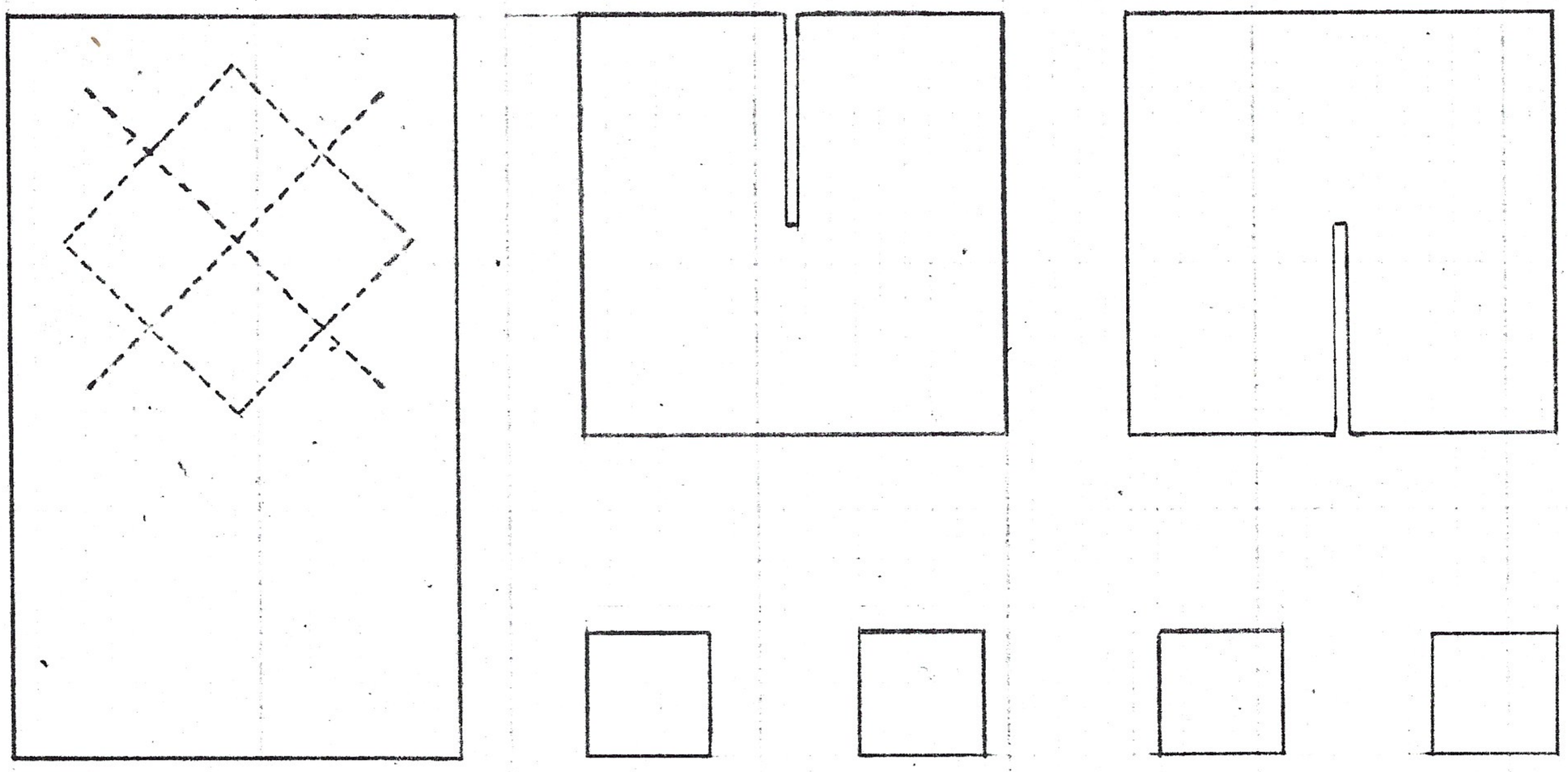
2. Cut tabletop, 2 base pieces and four squares to position base.

3. Slot base pieces, fit together, glue and tape joints.

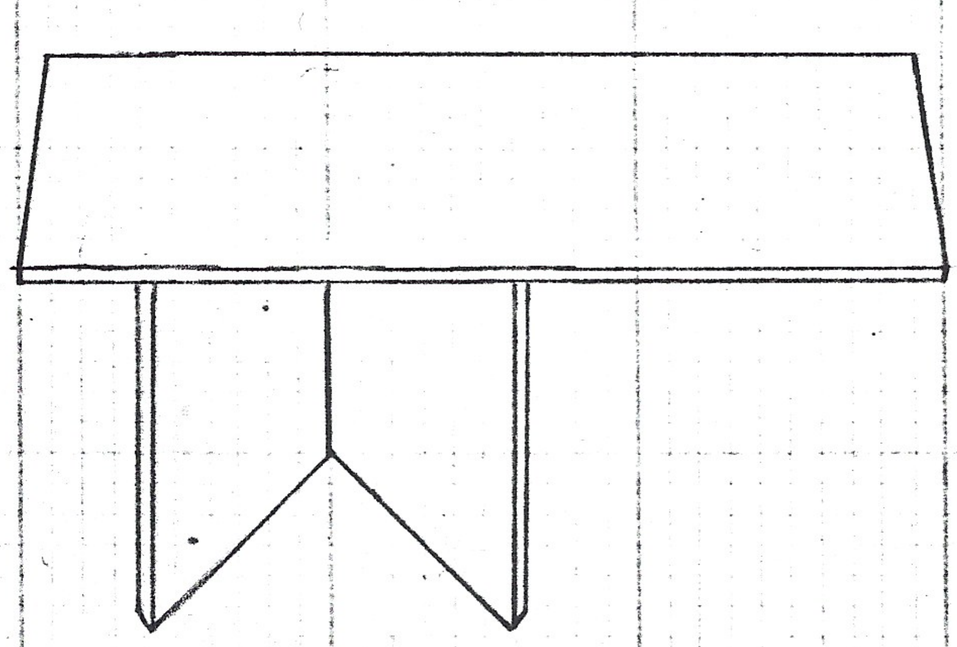
4. Position base on bottom side of table top. Glue joints. Glue squares to bottom side of table top in corners formed by base. Tape joints.

5. Tape edges and paint. (Paint both sides of Tri-wall to prevent warping. Unsupported end of table will warp easily.)

TABLE



Tri Wall - Slot construction
Paper Tape for edges + joints
Glue for joints
Paint
Cost @ $3.00

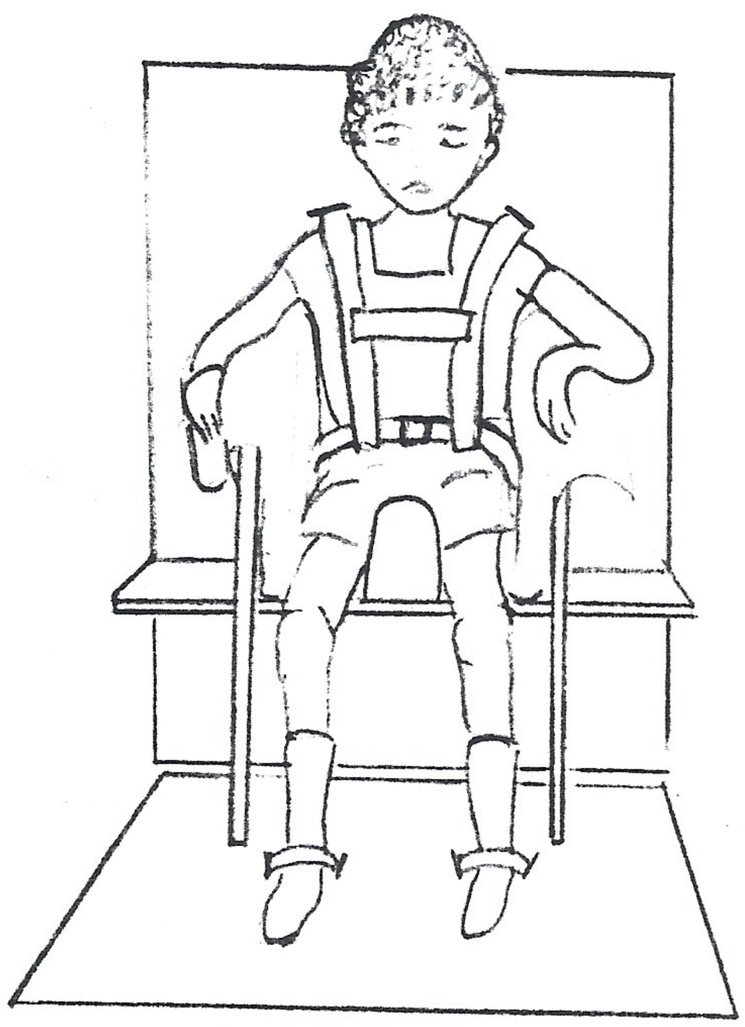


HIGH BACK CHAIR: VARIATION OF BASIC CHAIR

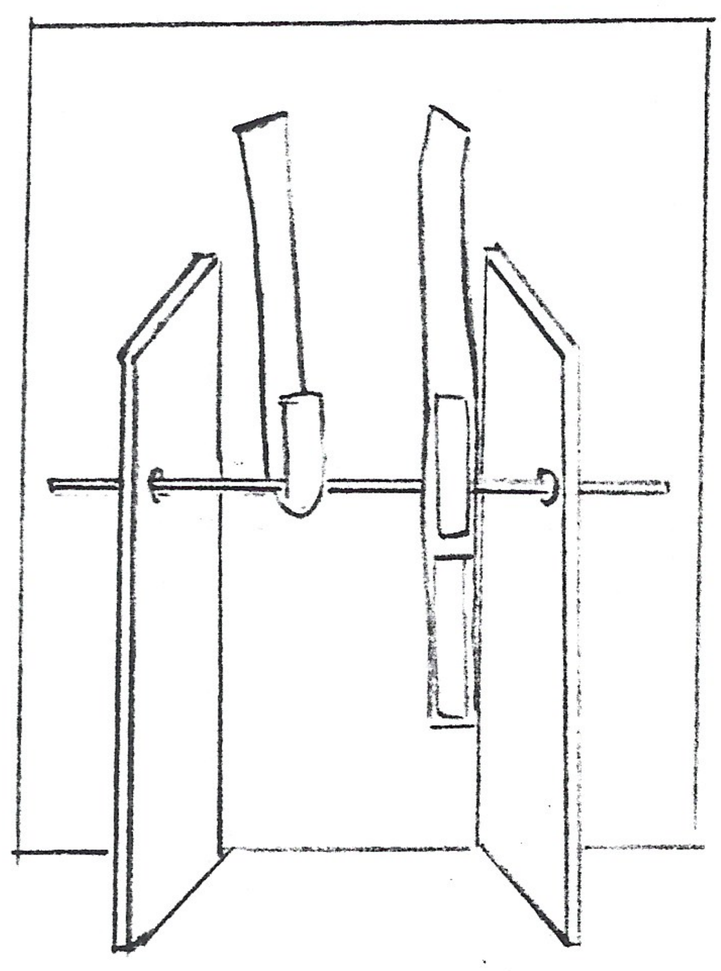
1) To provide better posture.
2) To facilitate back extension and body symmetry.
3) To prevent extensor thrust.
4) To provide trunk support.
5) To maintain hip abduction, preventing scissoring.
6) To prevent loss of head control backwards.

Precautions and Considerations

1) Each child needs to be evaluated and measured very carefully to ensure proper fit and to adequately meet each child's individual needs.
2) Pressure points need to be checked in order to prevent skin breakdown (student may have to build up tolerance to use of chair).
3) Keep seat belt and harness fastened to prevent student from falling and to maintain proper position.
4) Do not leave student in chair for more than 30 minutes, ideally, 1 hour at the most.



FRONT VIEW



BACK VIEW

HIGH BACK CHAIR WITH FOOTREST

(Variation of Preceeding Chair)

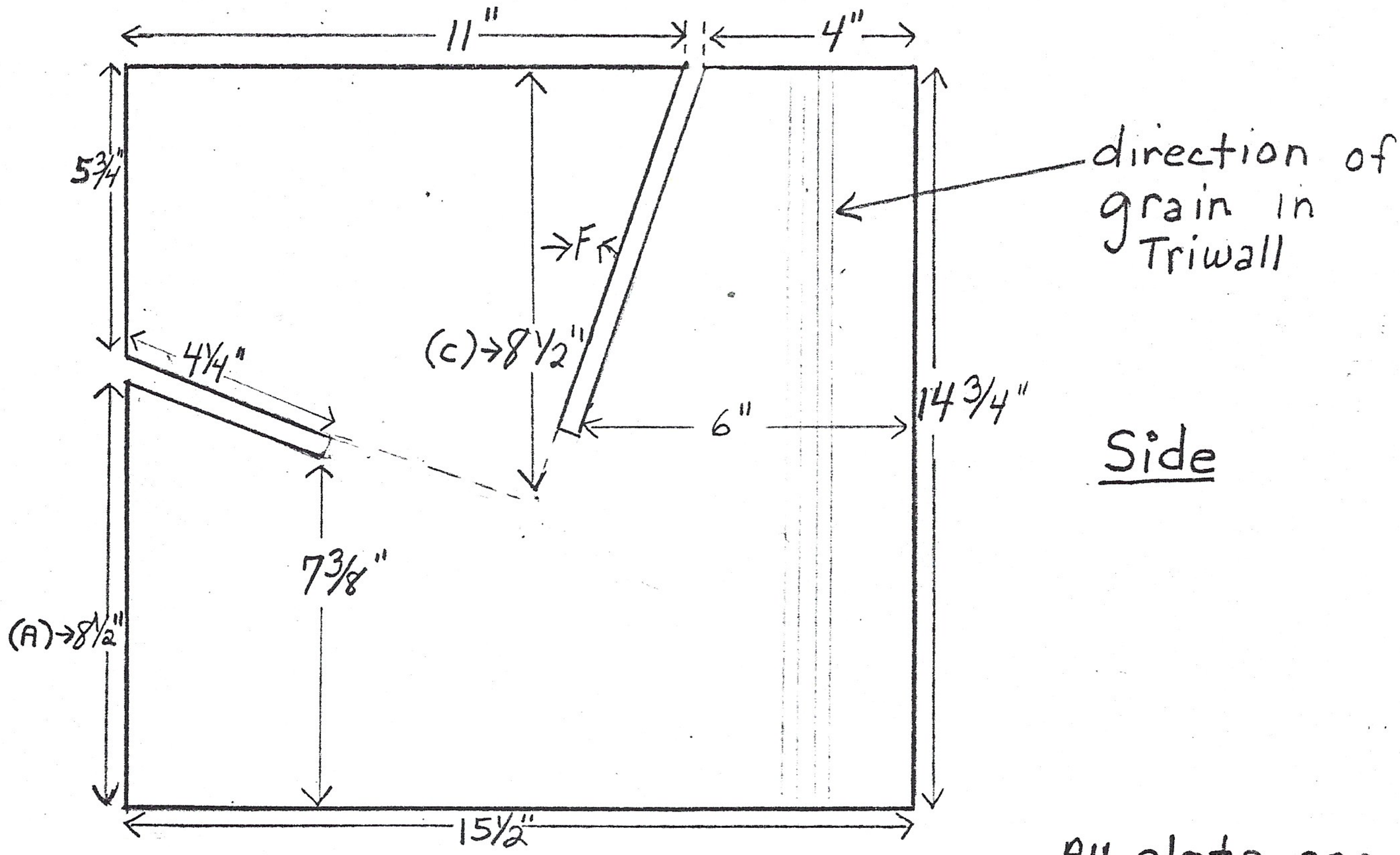
Supplies:
- Tri-wall
- ½" foam
- styrofoam
- upholstery material (I used terry cloth)
- 1" webbing
- Velcro
- 3/8" dowel
- D-ring
- 2" gummed tape
- paint
- white glue

Estimated Cost: $5.00

Directions:

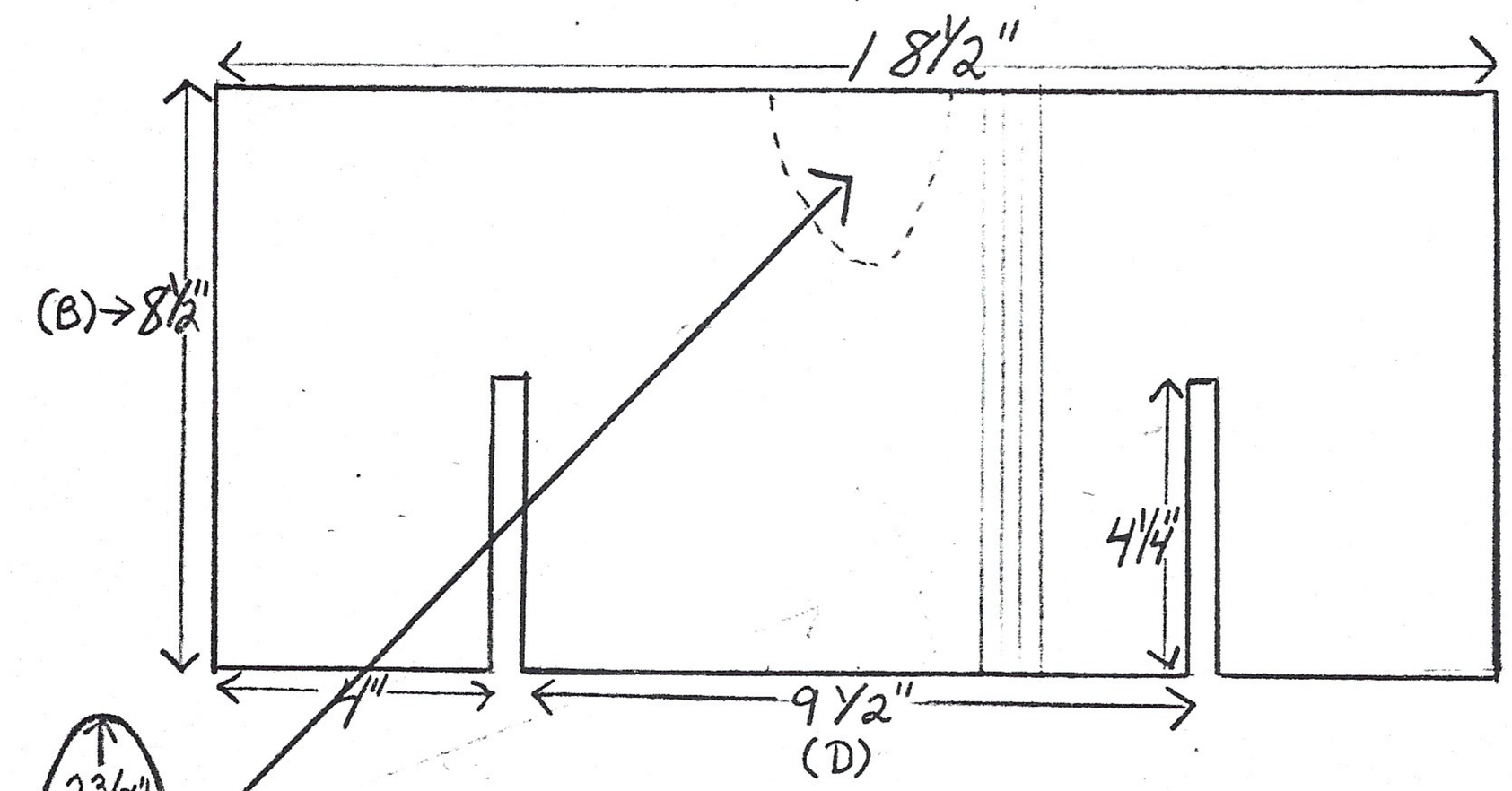
1. As in #1 of Chair except will also need to measure the child from seat to top of head for height of back (call this measurement C a). Also, J will be changed to read - back slots in back and sides are half of side measurement at an angle.
2. As in #2 of chair.
3. Add footrest: Cut the same width as seat. The depth should be twice the front to where back and side join at floor. The slot should be placed the same width as in seat and should be half of the depth.
4. Glue and tape joints. Tape all edges.
5. Cover styrofoam abductor wedge with foam and vinyl.
6. Glue styrofoam wedge center front of seat.
7. Cut foam:
   a. seat: cut to fit inside seat with cut-out to fit around wedge.
   b. back: cut to fit back of chair up to child's shoulders.
   c. sides: cut to fit sides of chair with 3 extra inches.
8. Cut 2 pieces of terrycloth same measurement as foam pieces plus 3/8" around edges. Stitch pieces together with ¼" seam leaving a 7" opening. Put foam pieces in and stitch up opening. Join foam pieces together with webbing as indicated in diagram.
9. Make slots for seat belt. To determine location, place child in chair and mark at sides of hip joints.
10. Make seat belt from webbing, D-ring, and Velcro. Place in slots.
11. Punch holes in Tri-wall in approximate location as indicated in drawing. Place dowel through holes.
12. Make H-strap to provide further trunk support:
    a. Mark top of child's shoulder joints. Make slots.
    b. With child in chair the distance from fastened seat belt through slot and down to dowel should be measured. Add 6" and cut two pieces of webbing. The cross piece should be distance between child's nipple plus 1½". Sew together making loop at one end for seat belt to slip through and placing Velcro at other end to fasten around dowel.
13. Make slots for feet straps. To determine location of straps, place child in chair and mark on each side of heel.
14. Make feet straps using webbing and Velcro. Place in slots.

Chair - High Back with Footrest



Side

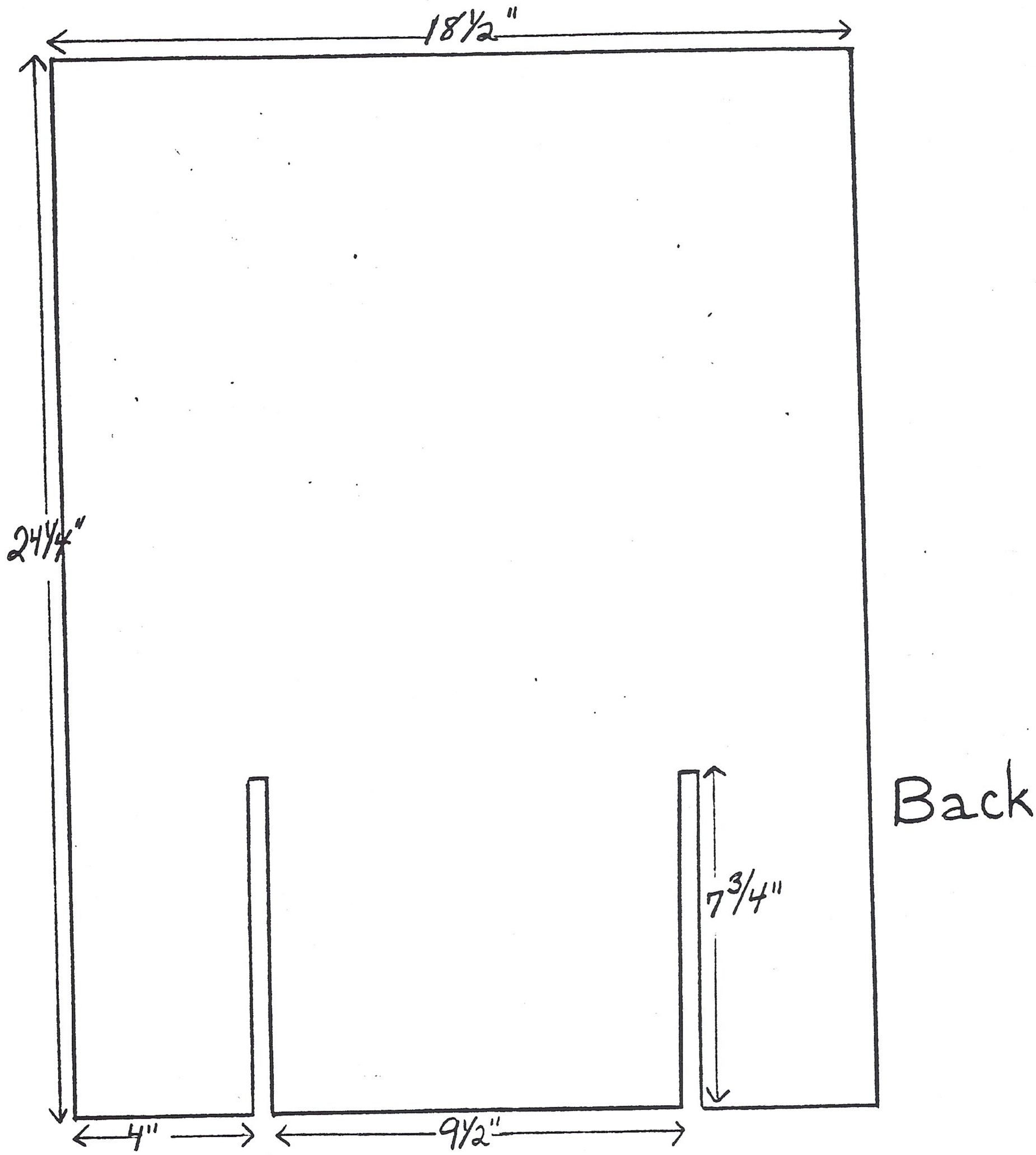
All slots are 1/2"

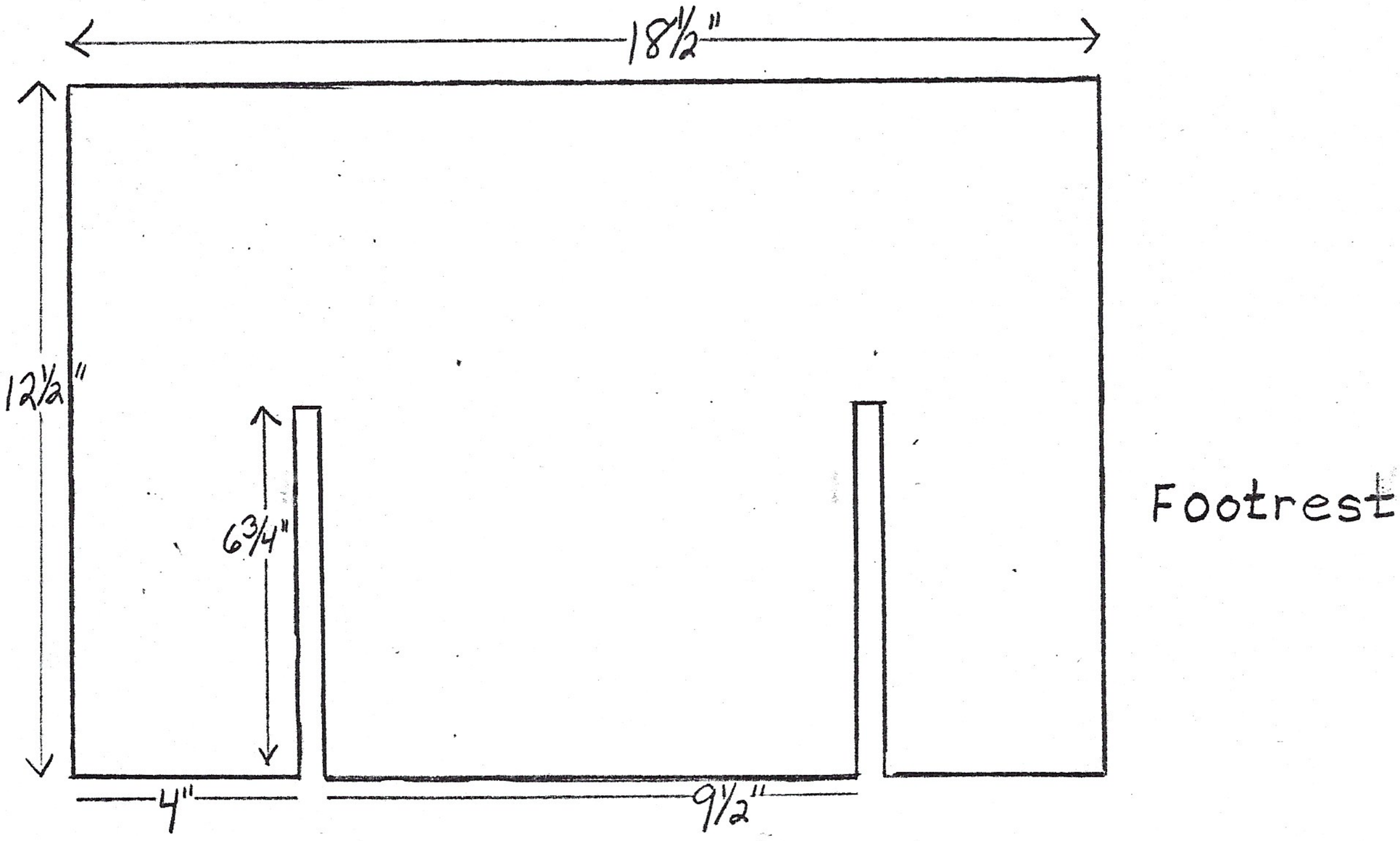


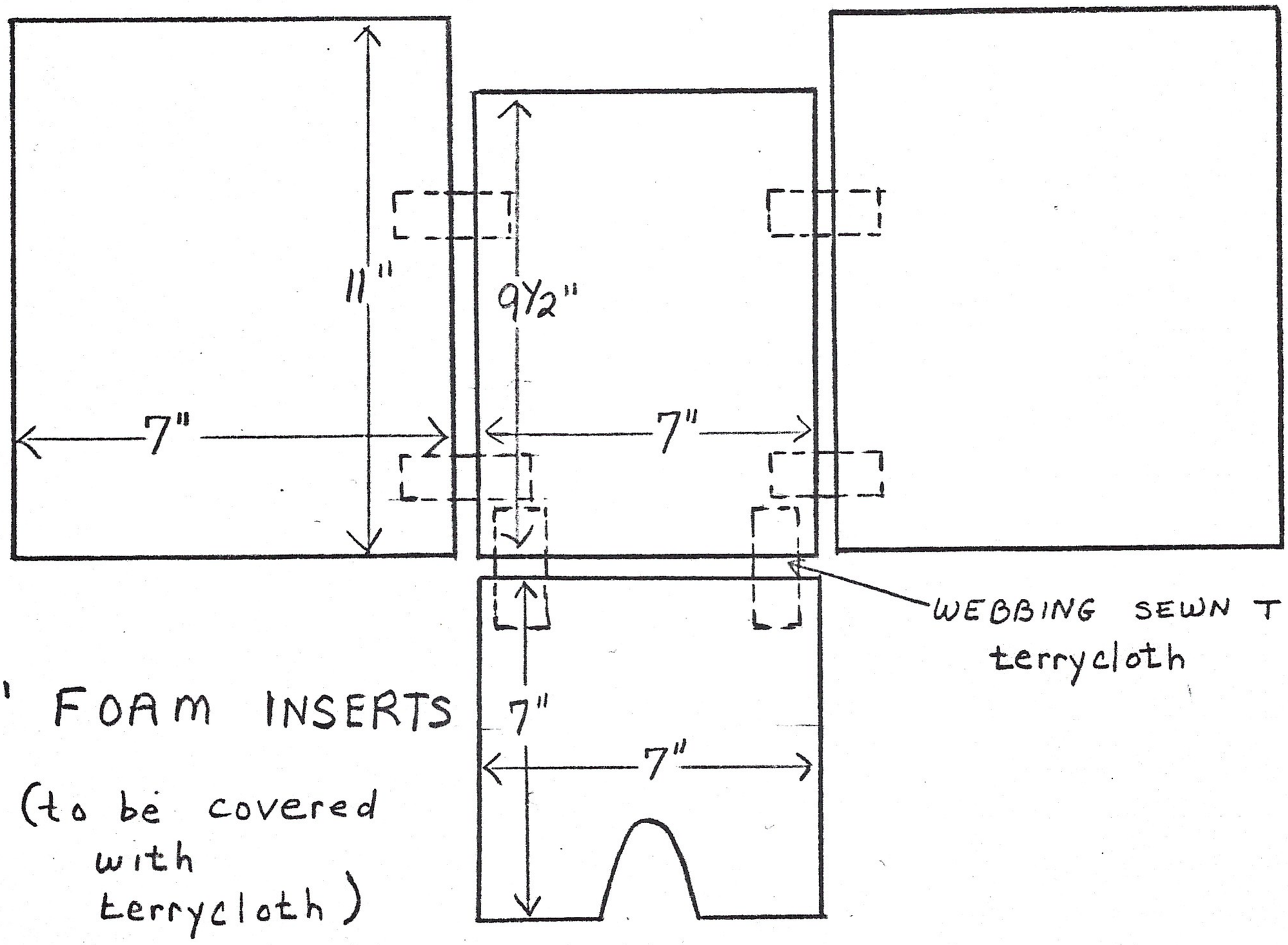
Seat

drawn to scale
1/4" = 1"

styrofoam abductor wedge


18½"
24¼"
Back
7 3/4"
4"
9½"





1" FOAM INSERTS

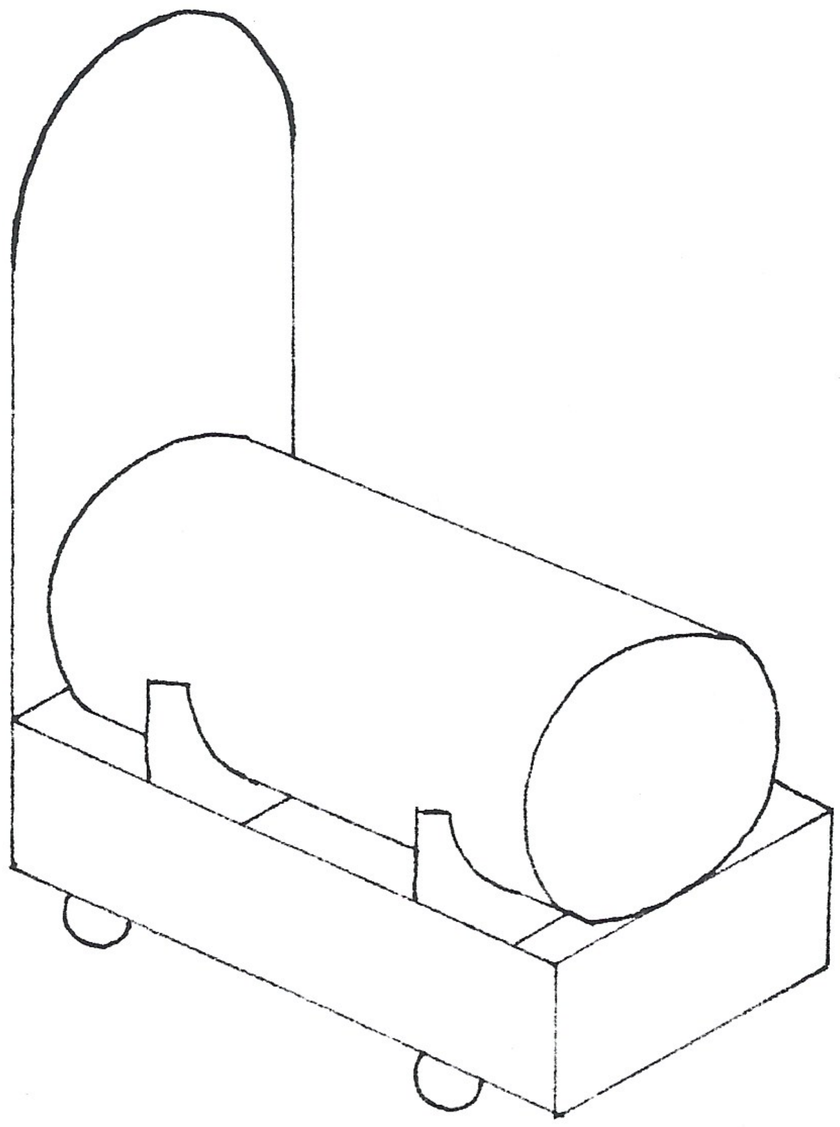
(to be covered with terrycloth)

ROLL CHAIR

1) To provide abduction of lower extremities.
2) To aid in facilitating righting reactions in sitting.
3) To offer means of mobility.
4) To assist in increasing head and trunk control.

Contraindications and Precautions:

1) Use with supervision.



ROLL CHAIR

Supplies: 3/4" inch plywood
1"X4" board
Tri-wall cardboard
7" diameter, 3/4" cardboard tubing
vinyl
4 casters
nails
screws
foam
staples for staple gun
2 corner brackets

Estimated Cost: 3/4" inch plywood - $1
1"X4" board - $3
Tri-wall cardboard - 50¢
cardboard tubing - 25¢
vinyl - no cost
casters - $5
nails - expendible
screws - expendible
foam - no cost
staples for staple gun - expendible
2 corner brackets - $2

Total Cost = $11.75

Directions: BASE

1. Length of base depends on size of child. Measure length of child's thigh from knee to hip. Base should be several inches longer. Roll chair in illustration is 20" long, 7½" wide. Cut boards equal lengths.
2. Nail together - (corner brackets may be used for additional support).
3. Four notches cut in sides of base, two on each side, ½ inch wide. Notches should be far enough apart to offer adequate support for tubing.
4. Cut two cardboard supports, length should exceed width of base by several inches. Height of chair may be determined with these supports. Child should be measured in sitting from knee cap to foot placed in neutral position (flat) on floor. Height of casters should be taken into account also.

Directions: BOLSTER

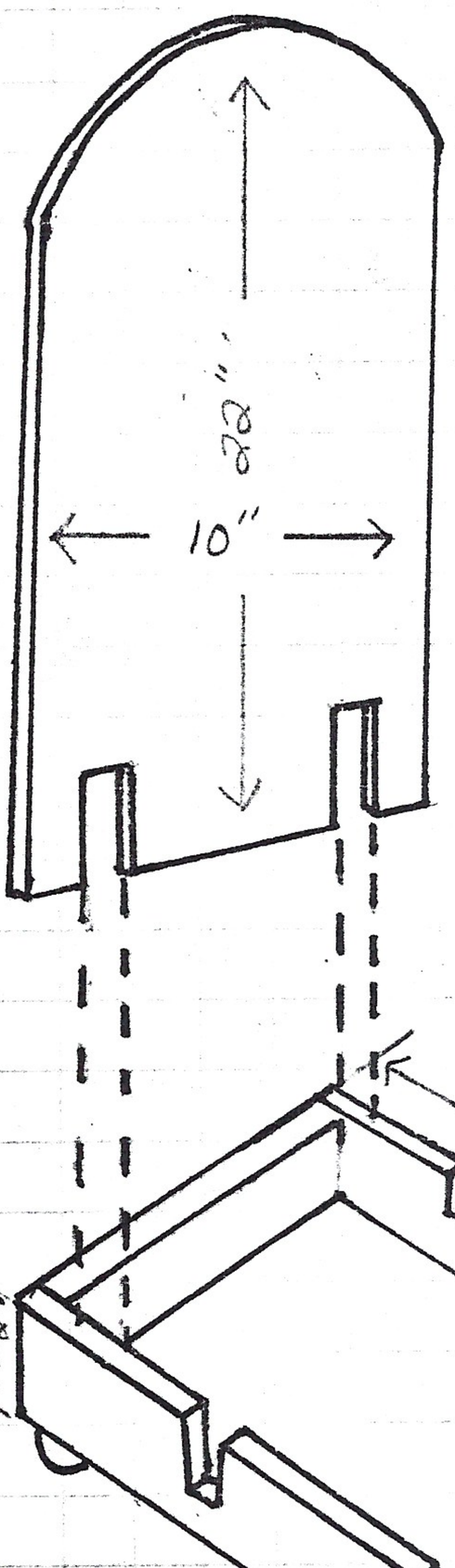
1. Cut cardboard tubing to desired length and cover with vinyl - foam padding may also be added. Vinyl can be glued or stapled to the tubing.

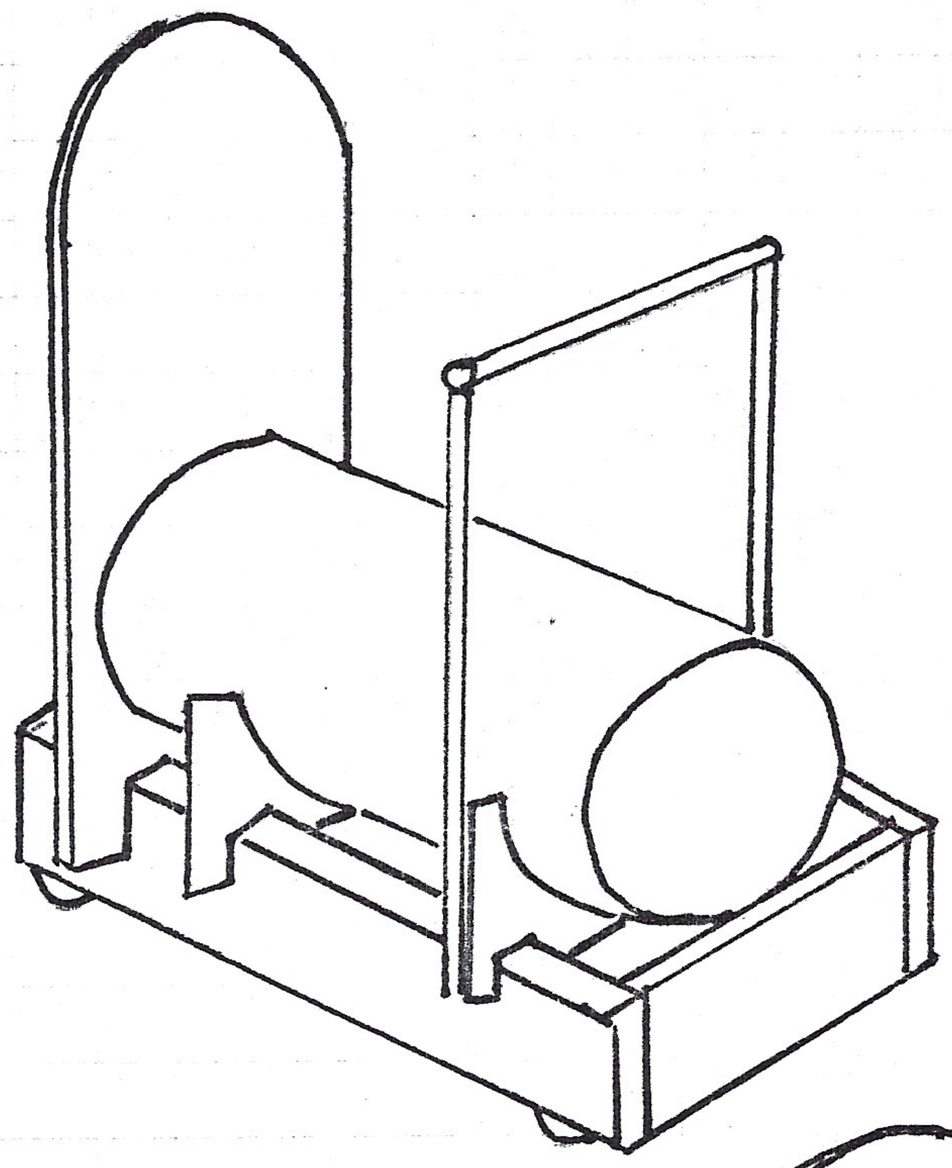
Directions: BACK

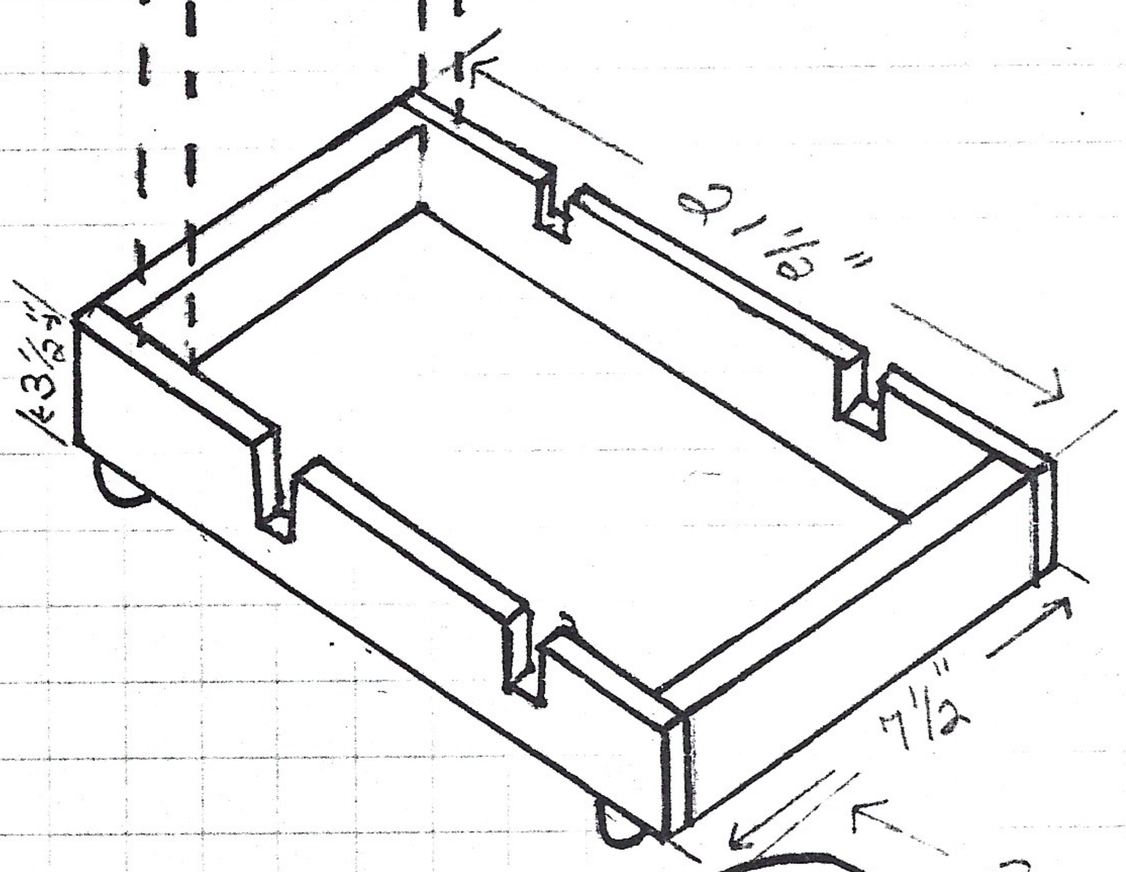
1. Cut plywood for back of chair, notches cut on the bottom of seat back to fit over back of base. Corner brackets used for securing back to base.
2. Foam cut to fit back of chair and glued to plywood.
3. Cover with vinyl - staple gun may be used for this. Wood and cardboard tubing cut with saber saw. Handle bar may also be included and should be high enough to keep head and trunk errect. Sand rough edges. Wood can be painted if desired.

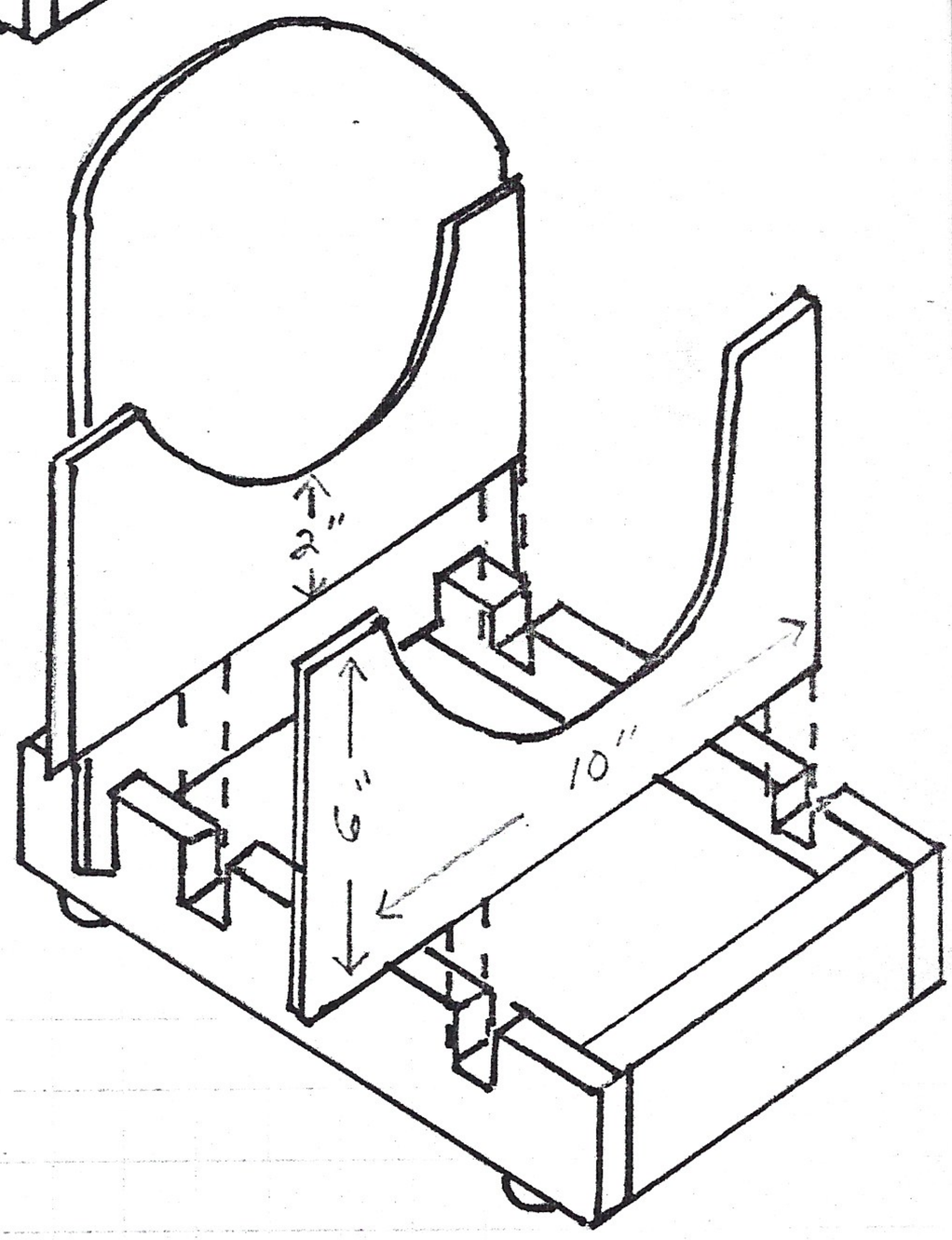
Roll Chair

* NOT Drawn To scale







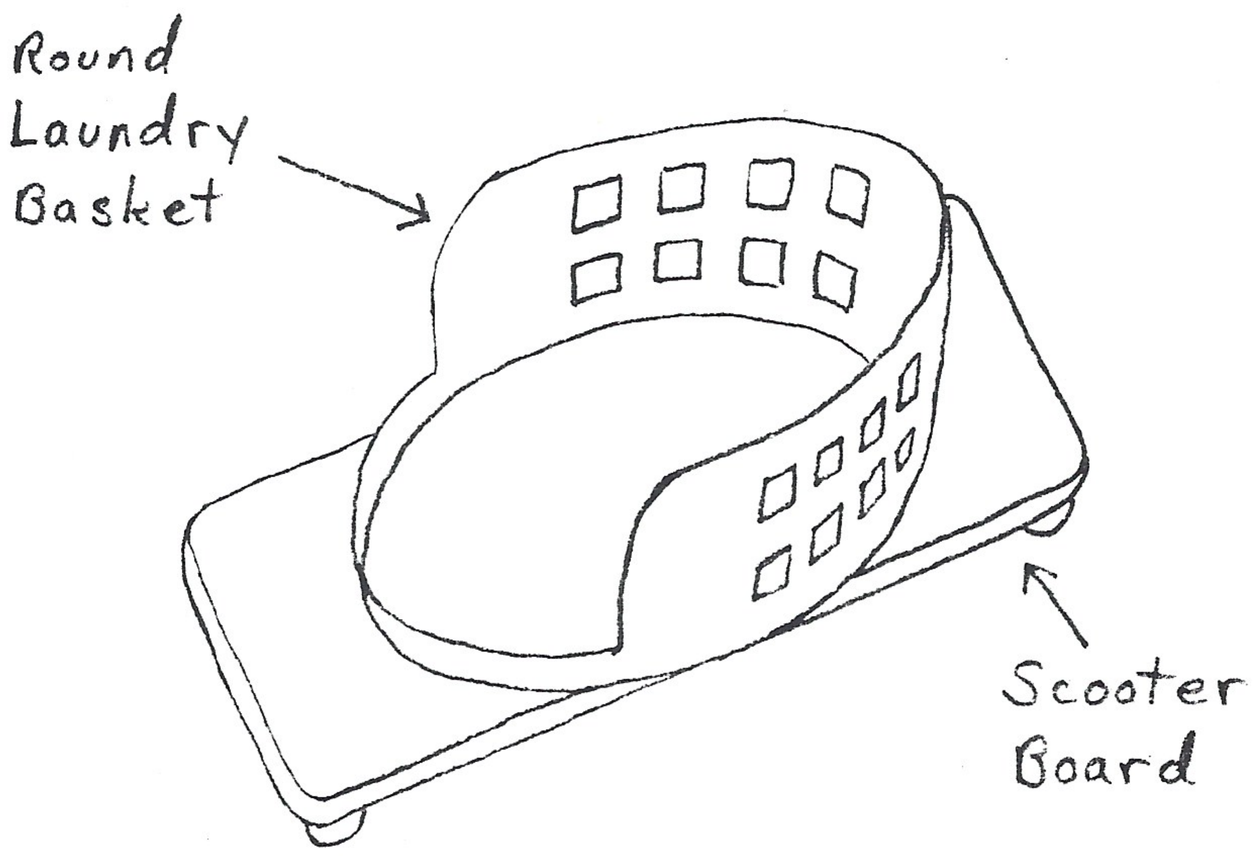


Base: made from
3/4" X 3 1/2" Board

Notches to hold bolster
supports, cut 1/2" wide

SCOOTER BOARD SEAT

To provide a secure seat on a scooter board for a blind child who has recently begun to explore her environment by pushing herself backward with her feet while sitting on a scooter board, but who frequently pushes herself off (frightening and requiring help, reducing independence.)



SCOOTER BOARD SEAT

Supplies: scooter board
round plastic laundry basket
5 nuts and bolts
10 washers

Estimated Cost: Used equipment available at school - no cost.
Nuts, Bolts, Washers - $1.00

Directions:

1. Cut off the top and one-third of the side of a round laundry basket, leaving the bottom and a small rim on the cut off side to help the basket keep its shape.

2. Punch holes for bolts around the edge of the bottom of basket.

3. Position basket on scooter board and mark through holes on scooter board.

4. Drill holes in scooter board and bolt basket on.

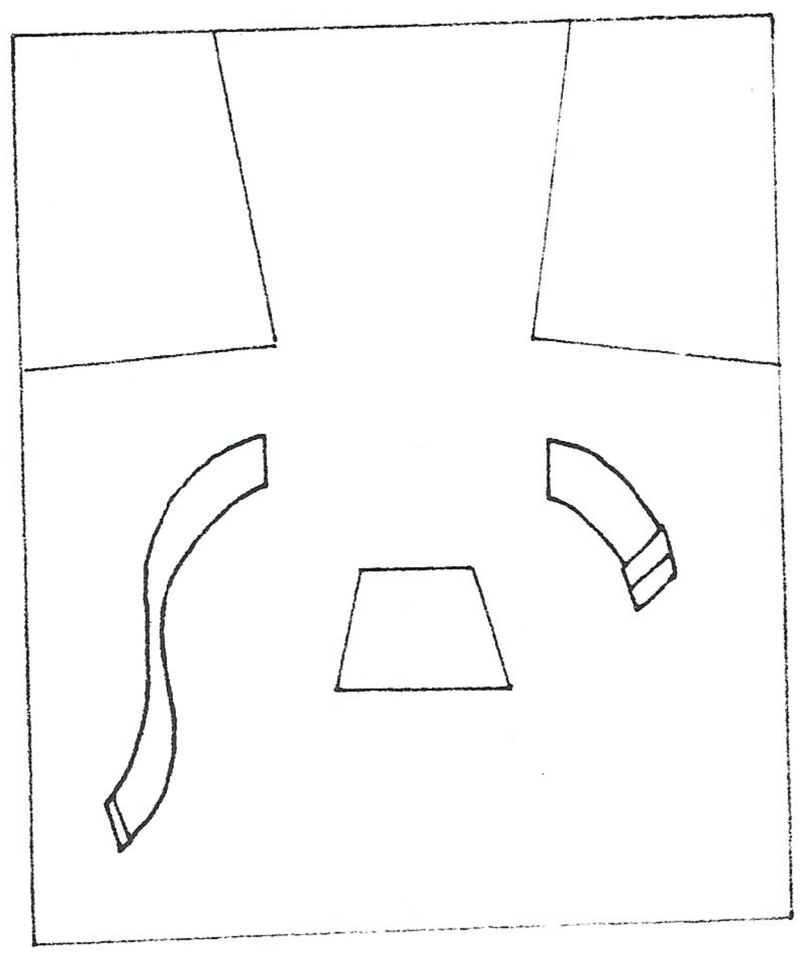
PRONE LIERS

1) To provide correct prone positioning for a child with recent hip surgery whose cast was just removed and who is assuming windblown position again.

2) To improve prone head control.

3) To improve hand and arm function and eye and hand control.

VERSION 1:



PRONE LIER - VERSION 1

Supplies: 3" thick foam
vinyl
Tri-wall
plastic mender or vinyl adhesive
spray adhesive
belt

Estimated Cost: $6.00

Directions:

1. Size of base is determined by size of child. Distance from underarm to ankle is length. Abduction of legs determines width.

2. Position child on base in good body alignment with legs abducted. Draw size and shape of side and abductor blocks on foam base.

3. Use pattern to cut blocks.

4. Cut tri-wall support 2"-4" smaller than base.

5. Use spray adhesive to center tri-wall on bottom of base.

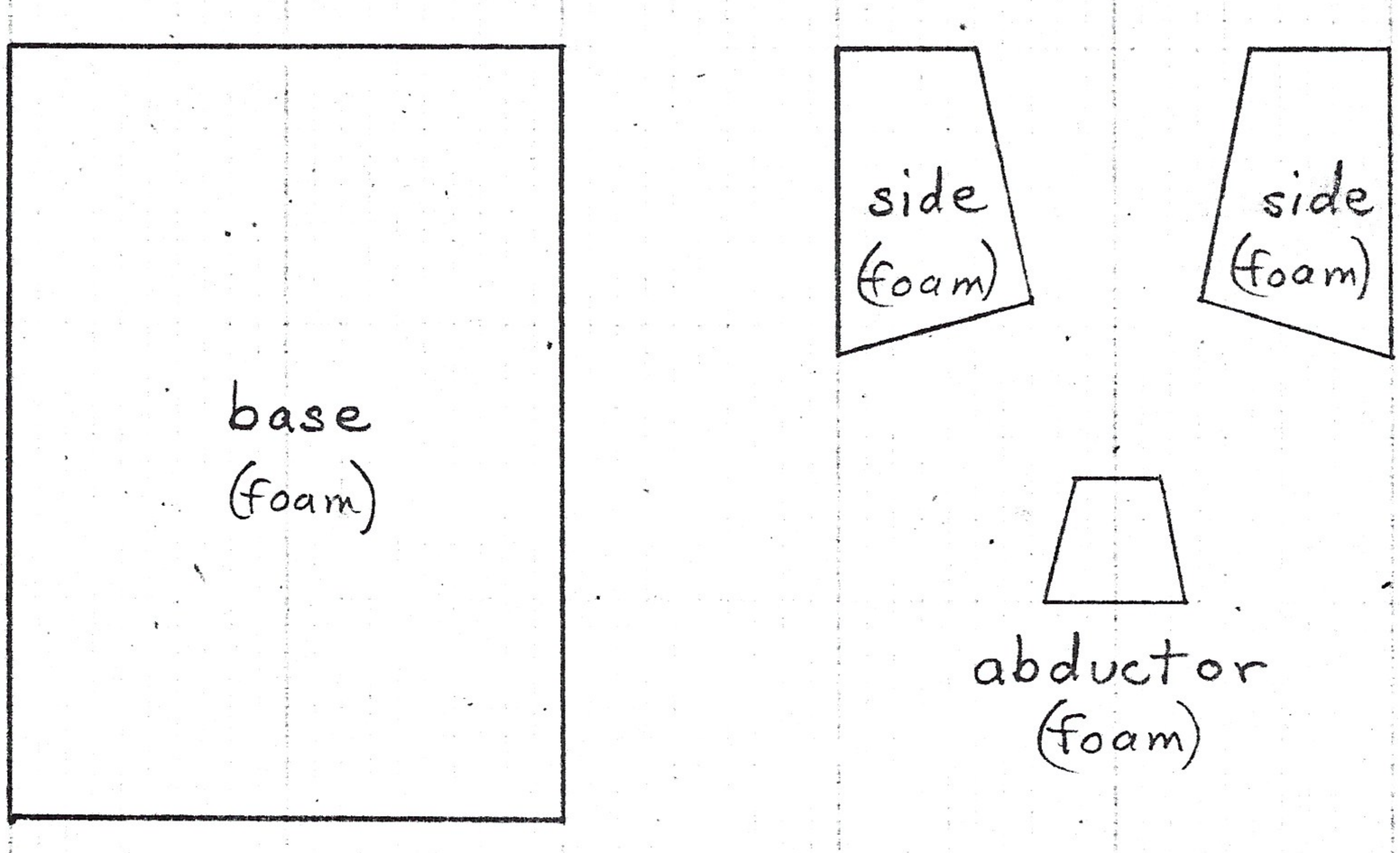
6. Cover base with vinyl.

7. Cover blocks with vinyl.

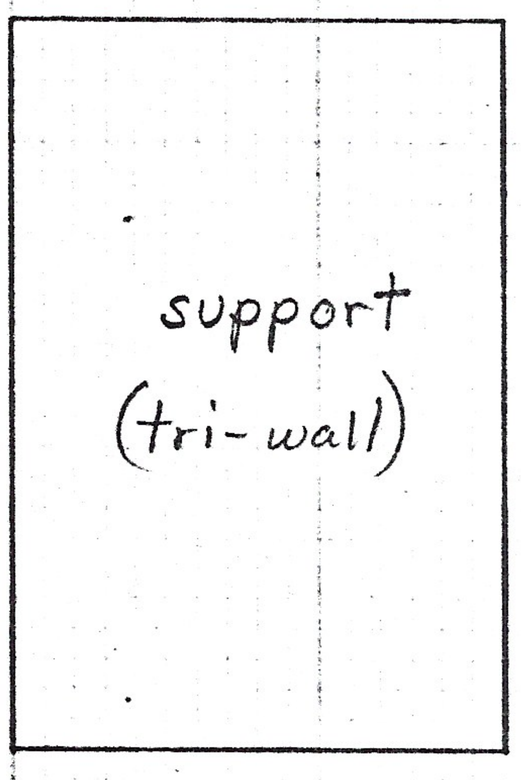
8. Glue blocks into position on base. (If child is likely to chew on prone positioner, don't use glue, sew the blocks onto base.)

9. Cut slots for belt through vinyl, foam, and tri-wall and thread belt through.

PRONE LIER - Version 1



Base, sides and abductor are cut from 3" thick foam



Support is cut from Tri Wall

Base + support are covered with one piece of vinyl. Other foam pieces are covered individually, then glued into position on base.

3" foam
Tri Wall
Vinyl
Plastic mender or vinyl adhesive
Spray adhesive
Belt
Cost about $6.00

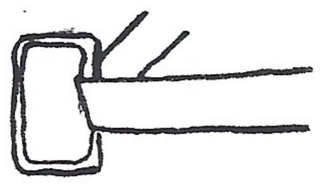
PRONE LIER - VERSION 2

Supplies:
- Vinyl
- 1" wide webbing
- 5" high styrofoam
- 1" foam 39" X 15½"
- foam scraps
- Velcro
- D-ring
- Plastic Mender (glue)
- white glue
- Tri-wall 39" X 15½"
- masking tape

Estimated Cost: $6.00

Directions:

1. Cut styrofoam pieces: 2 - 4" X 9" (or 10"); 1 - 3½" X 5" (wedge shape); 1 - 3" X 10¼".
2. Glue styrofoam pieces on Tri-wall as indicated on diagram.
3. Cut holes in foam, so foam can fit around styrofoam pieces. Use white glue, glue in place.
4. Cut a 36" X 50" piece of vinyl. Cut holes so vinyl can fit around styrofoam pieces.
5. Place vinyl on prone lier, overlapping in back. Ends should be folded as when wrapping a gift. Glue using plastic mender glue overlapping and folding ends in place. Use masking tape to hold until glue has dried.
6. Cover styrofoam pieces with foam, glue in place. Then cover with vinyl, glue in place.
7. Measure and cut slots for strap across waist and over feet.
8. Cut webbing: sew D-ring on one end.



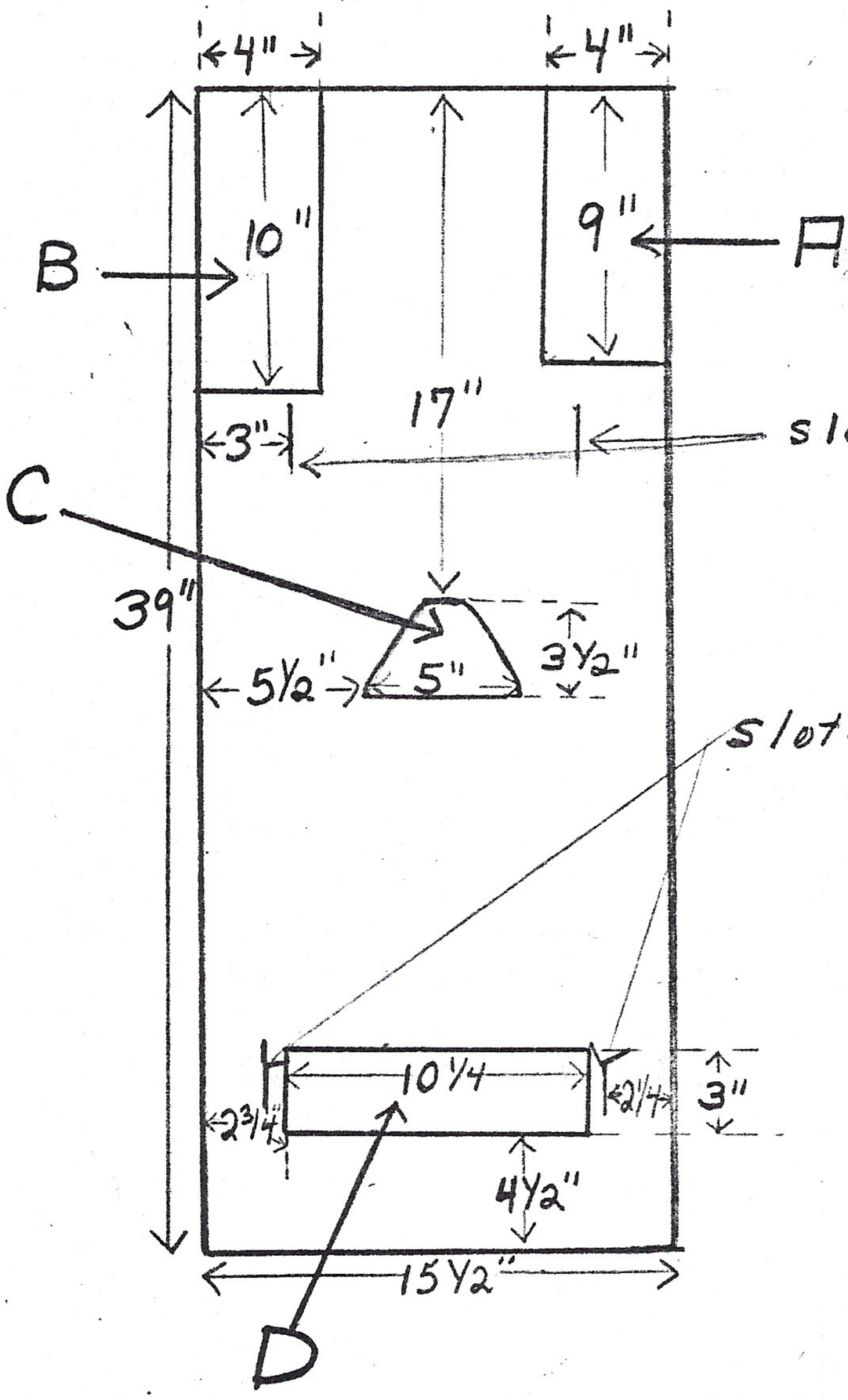
   Place through slots.
9. To measure for Velcro - place child on prone lier and place webbing over child through D-ring. Mark for Velcro.
10. Sew on Velcro.

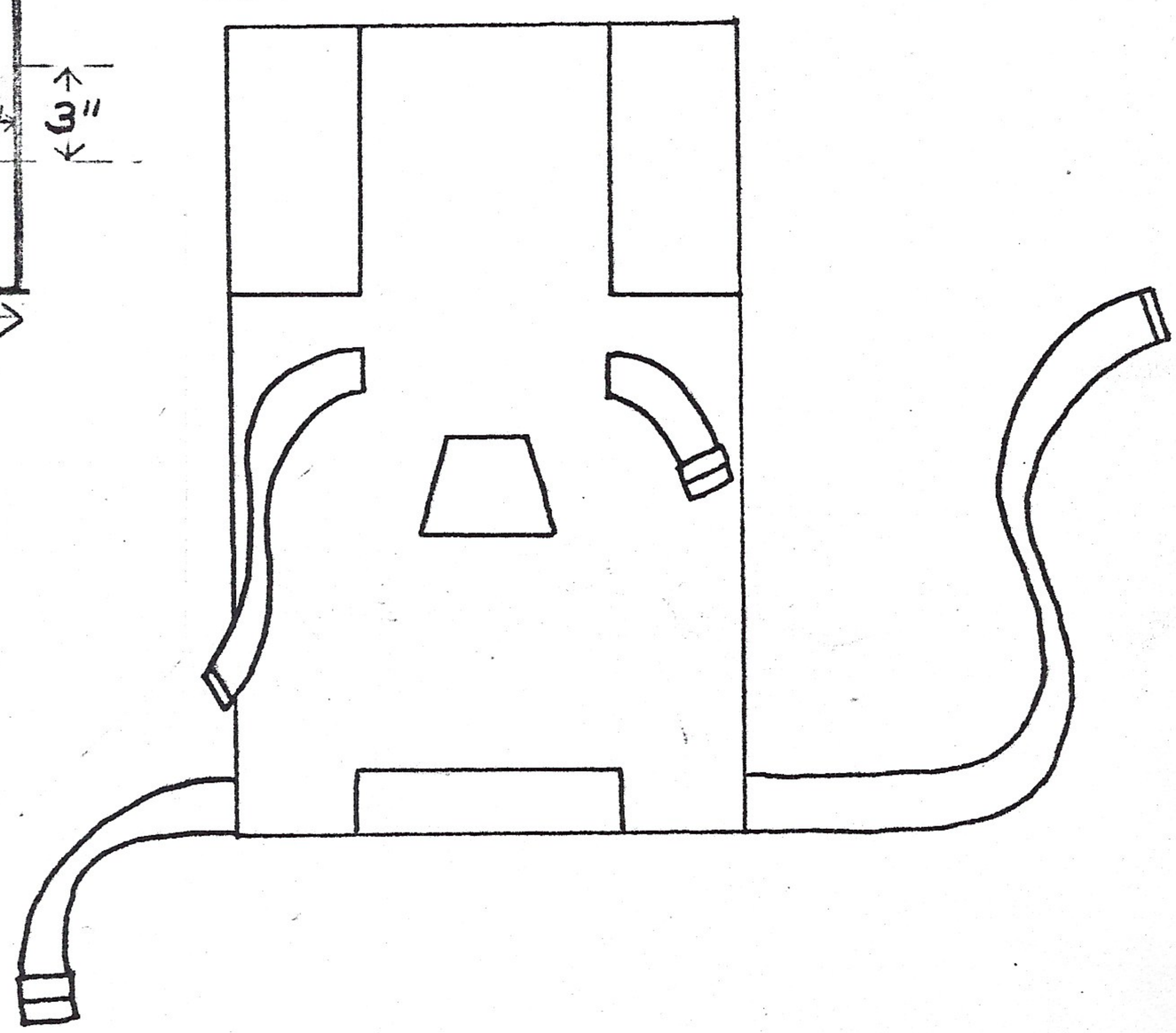
Adjusting Prone Lier for Other Children:

1. Place child on cut piece of Tri-wall with his underarms at top edge and his body symmetrical and centered on Tri-wall.
2. Draw lines on both sides of his chest and his waist.
3. Spread his legs and draw around inner border of his legs and crotch.
4. Mark 2" before ankle (for placement of foot block).

Prone Lier

version 2





PRONE LIER - VERSION 3

Supplies:
- Tri-wall 39"X15½" & 15½"X4½"
- 2 dowels 7"X3/4"
- 4 pieces plywood 2"X2"X½"
- 1" to 1½" foam 39"X15½"
- foam scraps
- vinyl 36"X50"
- white glue
- vinyl scraps
- upholstery thread
- 5" styrofoam
- 1" webbing
- Velcro
- D-ring

Estimated Cost: $5.00

Directions:

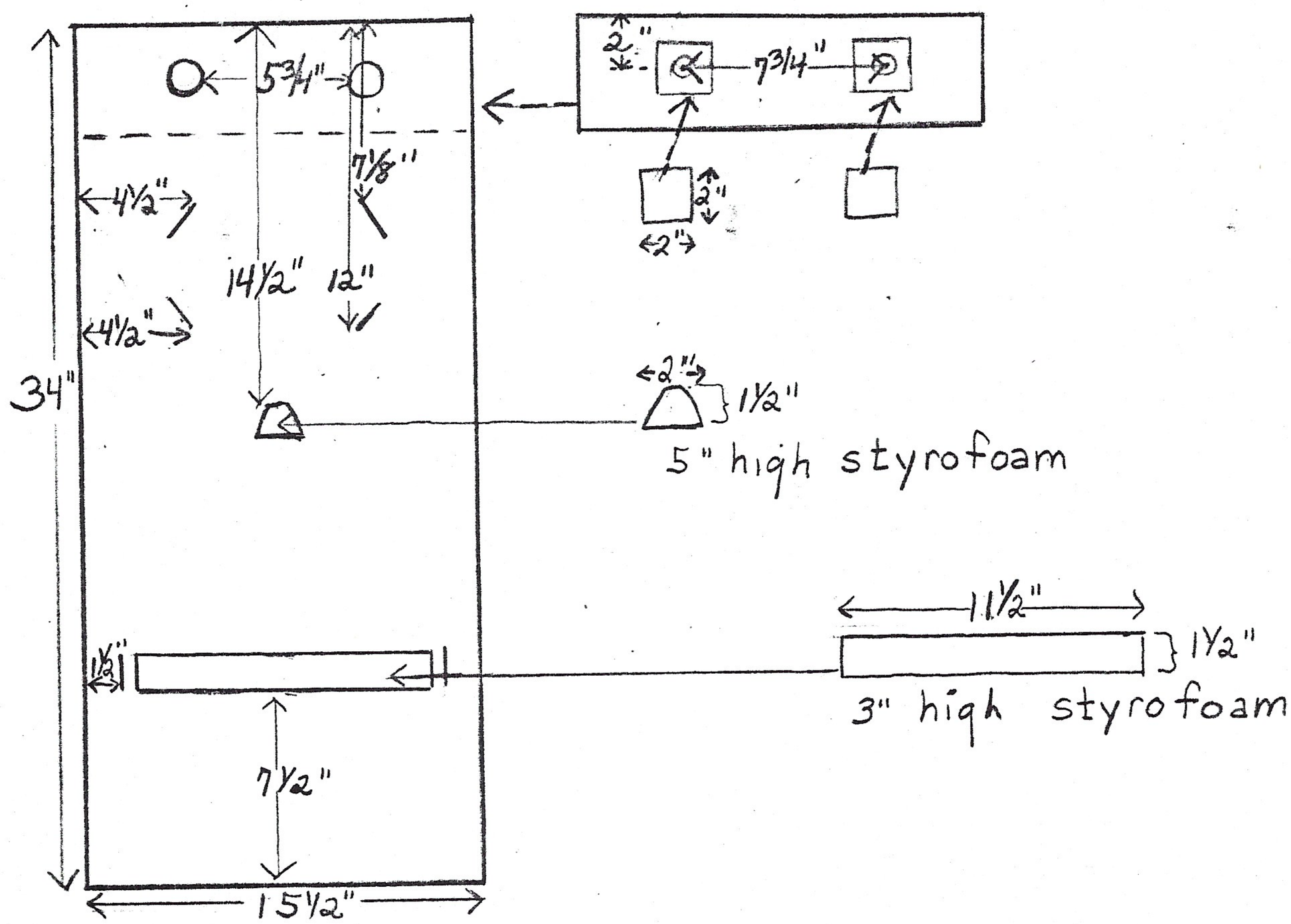
1. Place two of the plywood squares on small piece of Tri-wall as indicated on diagram. Trace around them. Cut holes. Glue plywood squares in holes.
2. Place other two plywood squares on bottom of large Tri-wall piece as indicated on diagram (use measurements for placement on small Tri-wall piece). Trace around them. Cut hole through first layer of Tri-wall only. Glue plywood squares in holes.
3. Glue small piece of Tri-wall on top of large piece of Tri-wall as indicated in drawing.
4. Bore two 3/4" holes, centered on top 2" squares, through all thicknesses. Glue dowels in holes.
5. Cut holes for dowels in large piece of foam. Glue in place.
6. Cut holes for dowels in large piece of vinyl. Place vinyl on Prone Lier, overlapping at back. Use upholstery thread to sew ends together (a few widely spaced stiches). Fold ends, as when gift wrapping, sew in several places with upholstery thread.
7. Cut styrofoam wedge and foot block as indicated on diagram. Cover pieces with foam and vinyl (use glue to hold foam and a few stiches to hold vinyl).
8. Tack (sew) covered pieces of styrofoam in place as indicated on diagram.
9. Cut slots for straps as indicated on diagram. Use a utility knife to go through all layers.
10. Make straps from webbing, D-ring, Velcro to criss-cross over hips.
11. Cover dowels with foam (use masking tape to hold) and then with vinyl (use upholstery thread to tack in place).

Adjusting Prone Lier for Other Children:

1. Place child on cut piece of Tri-wall with his underarm at top edge and his body symmetrical and centered on Tri-wall.
2. Draw lines on both sides of his chest, waist, and hip joint.
3. Open his legs and draw around inner border of his legs and crotch.
4. Mark 2" before ankle (for placement of foot block).

Prone Lier

version 3



drawn to scale

VERSATILE USES OF PRONE LIERS

1) On Ground or on Wedge
   a) To extend, abduct and externally rotate the lower extremities in a nonweight-bearing position.
   b) To stimulate head, trunk control and body symmetry.
   c) To encourage weightbearing on right arm.
2) In Hammock - Swinging Only
   a) To extend, abduct and externally rotate the lower extremities in a nonweight-bearing position.
   b) To stimulate head, trunk control and body symmetry.
   c) To provide stimulation of vestibular system in prone position.
   d) To allow optional prone position, with student's cooperation (having fun).
3) On Scooter Board
   a) To extend, abduct and externally rotate the lower extremities in a nonweight-bearing position.
   b) To stimulate head, trunk control and body symmetry.
   c) To encourage weightbearing on right arm.
   d) To facilitate use of the right arm.
   e) To provide a means of mobility in the prone position.
   f) To allow optional prone position with student's cooperation.

Precautions and Considerations:

1) Fasten hip and ankle straps to maintain student in proper postion, if necessary.
2) Make sure child is aligned symmetrically before fastening straps.
3) Do not leave student unattended on scooter board or in hammock.
4) Do not leave child on prone lier for more than 30 minutes.

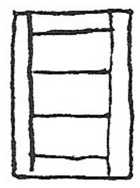
SCOOTER BOARD FOR PRONE LIER

Supplies: 2 pieces wood 39" X 1½" X 3/4"
3 pieces wood 14¼" X 1½" X 3/4"
2 pieces molding 39" X 3/4" X ½"
1 piece molding 15 3/4" X 3/4" X ½"
4 casters (I prefer good rubber casters-$12)
1" nails
3" screws
varnish

Estimated Cost: $15.00

Directions:

1. Screw 1½" X 3/4" pieces of wood together to form:



as indicated in diagram.

2. Nail the 2-39" moldings in place.

3. Nail the 15 3/4" molding in place.

4. Put casters on as indicated in diagram.

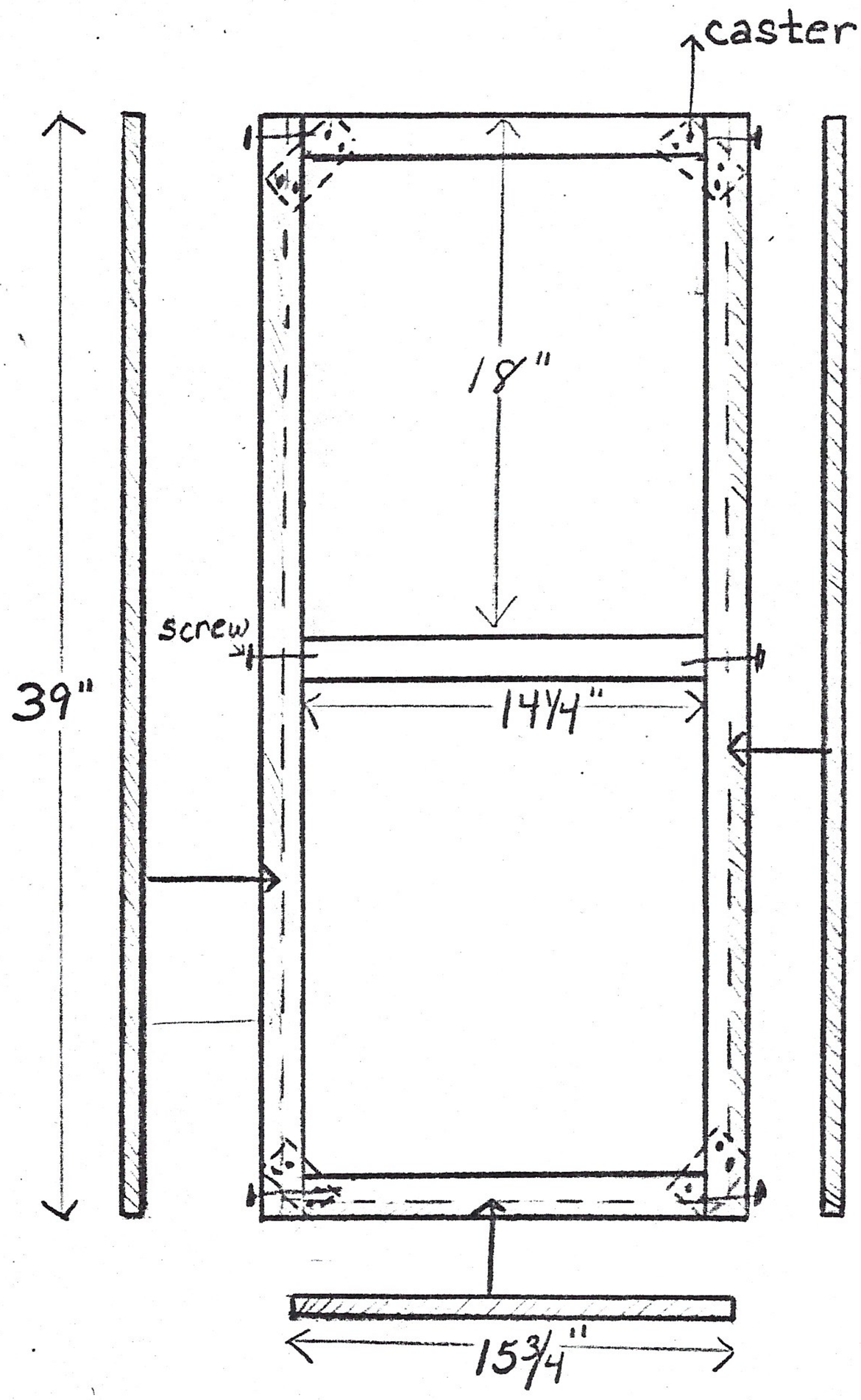
5. Sand and varnish.

Adjusting the Scooter Board:

1. The finished width of the scooter board should be the width of the finished prone lier plus 1½".

2. The finished length of the scooter board should be the length of the prone lier plus 3/4".

Scooter Board for Prone Lier



drawn to scale

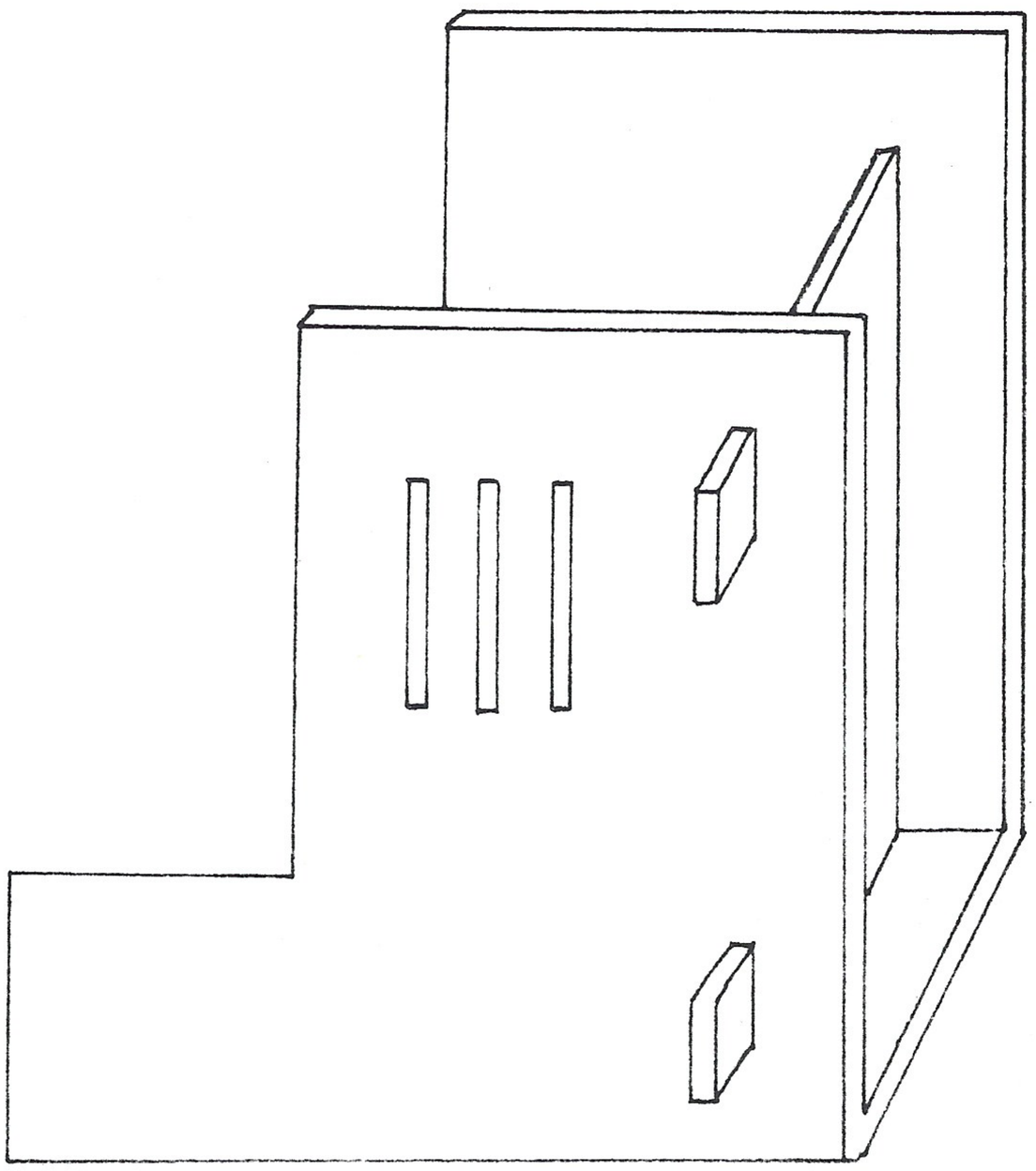
KNEELER

a. To improve upright head control.

b. To improve body symmetry.

c. To provide a position for weight bearing.

d. To be adjustable for a variety of children so it can be determined whether or not a child should have his own kneeler constructed.



ADJUSTABLE KNEELER

Supplies: Tri-wall - slot and tongue construction
2" gummed (paper) tape to cover edges and joints
white glue for joints
paint

Estimated Cost: $7.00

Directions:

1. Cut sides and bottom in one piece so the grain of the Tri-wall will be vertical in the sides of kneeler (as indicated by arrows).

2. Cut backboard.

3. Cut front with grain vertical.

4. Score (cut grooves through 2 layers of Tri-wall) along dotted lines indicated on pattern.

5. Cut slots on sides as indicated on pattern.

6. Fold sides up along scoring and fit tongues on front into slots on sides while folding (Note that bottom of front is 3" from tongues. If upside down, it won't fit.)

7. Glue and tape joints. Tape edges. Paint all surfaces (painting is optional, but if done, both sides of Tri-wall should be painted to prevent warping).

8. Four foam pads are used in kneeler. All are 3" thick and 12" wide, but are varying lengths. One or more pads is always used under child's knees. Other pads may be used in front or at sides depending on child's needs.

9. Once child is positioned, slide backboard through slots on sides. (Edges of backboard should not be taped since tape will catch and tear in slots.)

ADJUSTABLE KNEELER

Drawn to scale: 1 small square = 1 inch

Arrows indicate grain

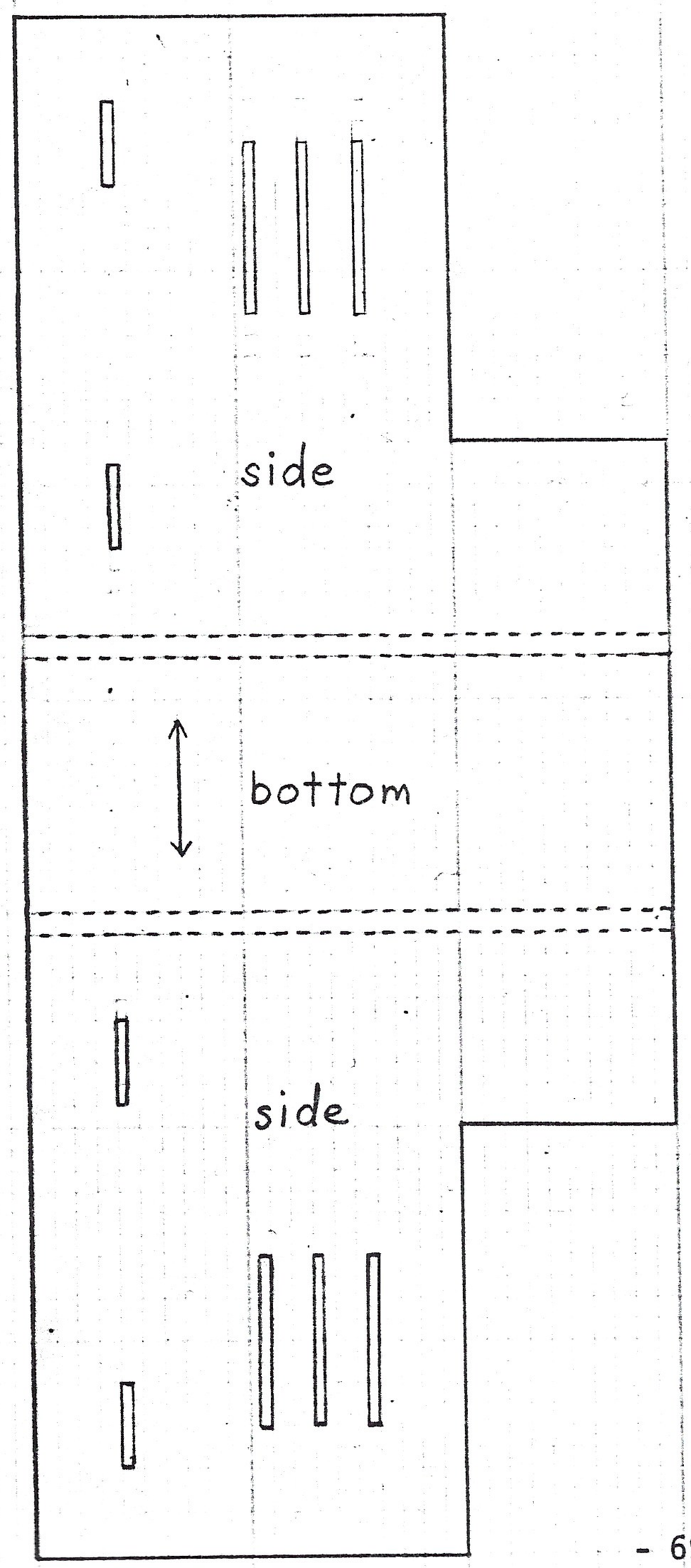
Tri Wall - Slot and tongue construction

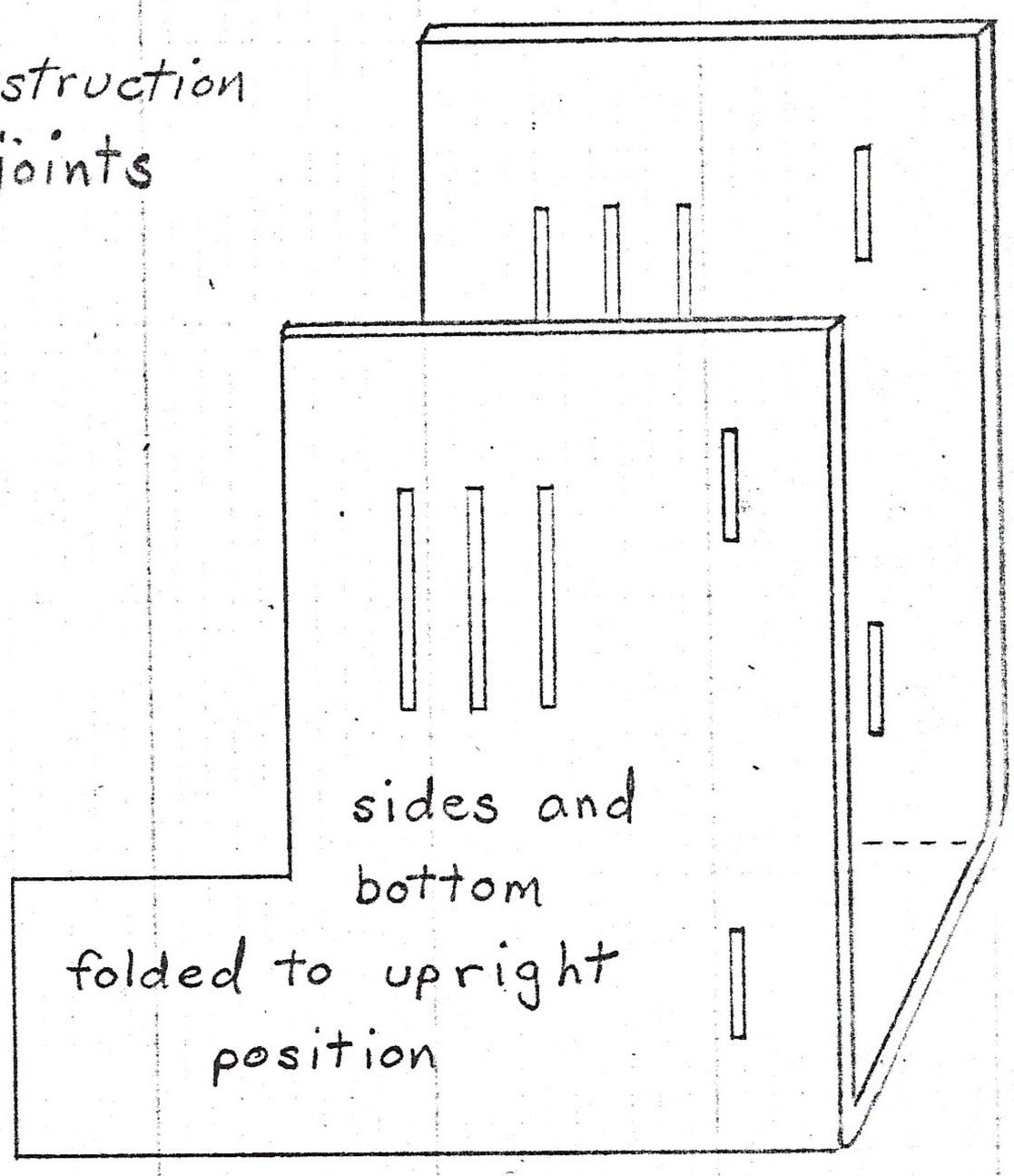
Paper tape to cover edges + joints

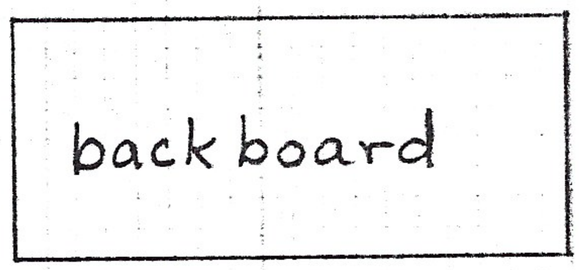
White glue for joints

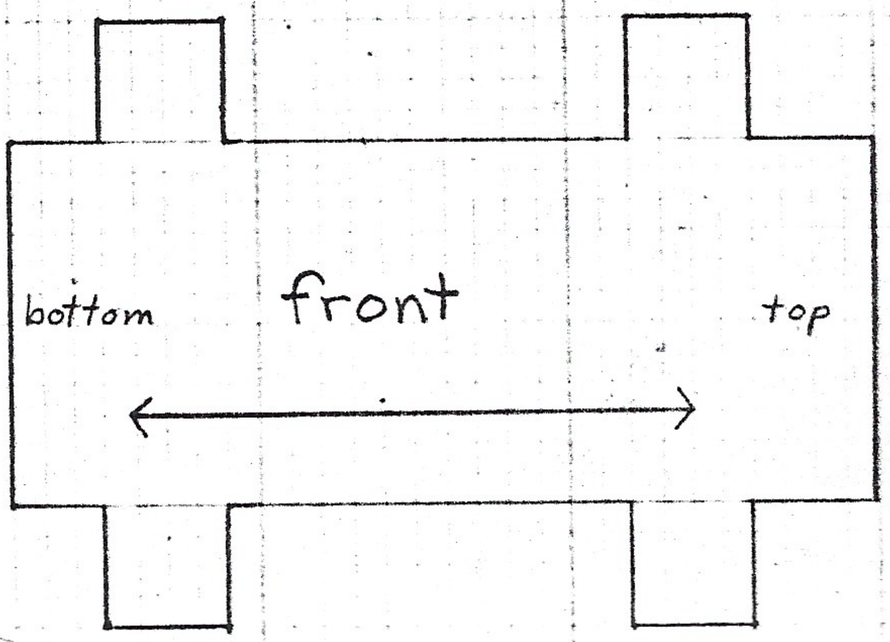
Paint

Cost @ $7.00







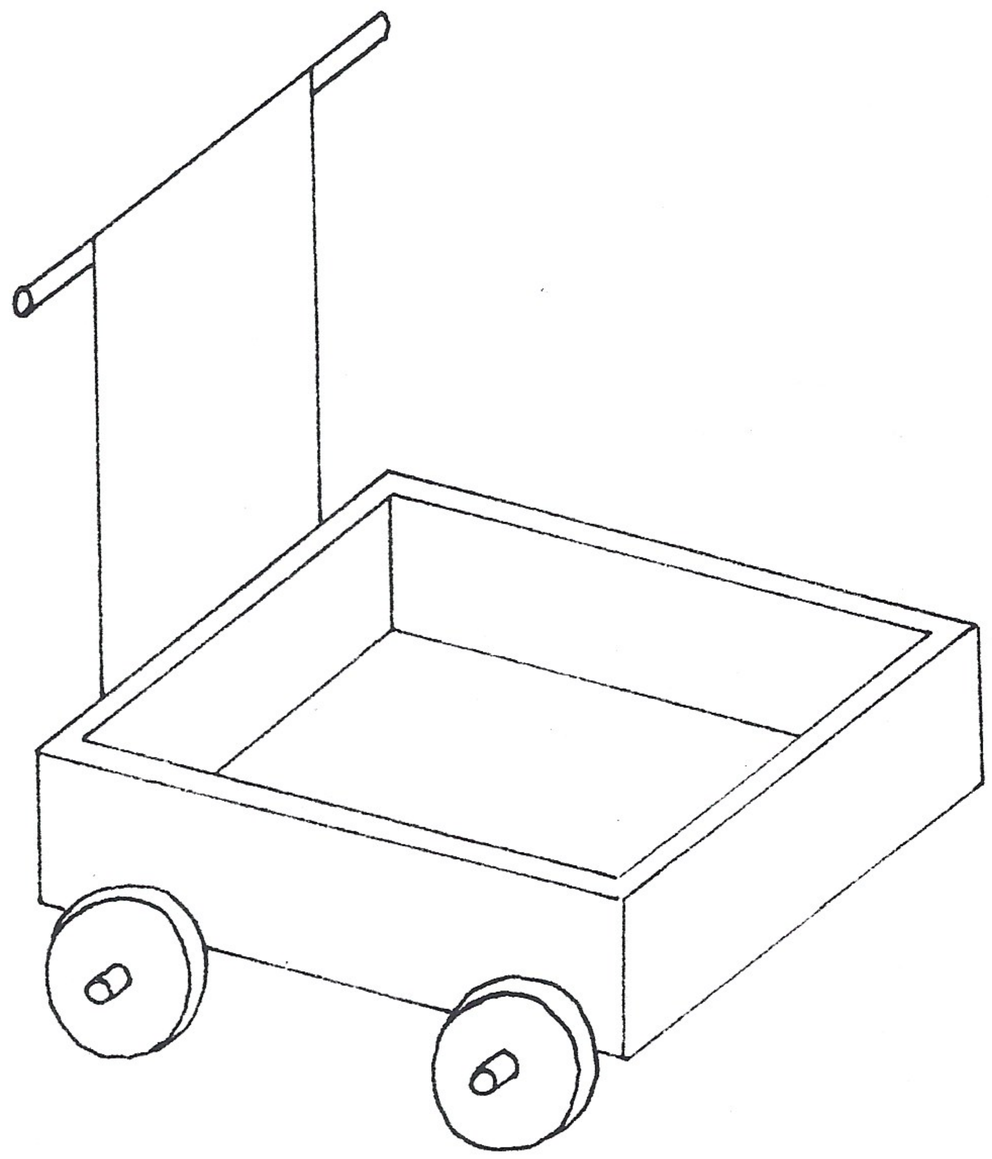


WAGON

1) Provide one mode of mobility.
2) Aid in improving head and trunk control.
3) Aid in improving ambulation.

Contraindications and Precautions:

1) Handle must be high enough to keep head and trunk errect.
2) Wagon must be heavy enough to prevent from tipping.



WAGON

Supplies:
1" X 4" board
4 wooden wheels
2 1" dowels
masonite
nuts and bolts
4 steel brackets
masking tape
Elmer's glue
4 plastic caps
nails

Estimated Cost:
1" X 4" board - $
4 wooden wheels - $1
2 1" dowels - $2
masonite - $1
nuts and bolts - 80¢
4 steel brackets - $1
masking tape - expendible
Elmer's glue - expendible
4 plastic caps - 5¢
nails - expendible

Directions: BASE AND HANDLE ASSEMBLY

1. Cut 4 pieces of 1" X 4" board at desired lengths, wagon is made 14" wide and 17" long. Care should be taken to make sure pieces are cut to fit together properly (measurements should be exact).
2. These pieces can then be nailed together (corner brackets may also be used for stability).
3. Bottom of wagon is masonite - cut same size as board measurement (14"X 17").
4. Masonite is also used for the piece holding the dowel rod handle. (14" high, 10" wide). Child should be measured to insure correct height. If the handle is too low, asymmetry with head and trunk may occur. Measure from 1½" from base of wagon (not floor) to child's shoulders once wheels are attached. (Measurement may be different for different children.)
5. 6 nuts and bolts were used to secure masonite to wagon base. Picture of placement of these is seen in the illustration.
6. 1" dowel rod used for handle, 14" in length (need to leave enough room to grip on either side). Use 3 nuts and bolts to secure handle to masonite. (Size of nuts is a factor - if they are too long and protrude, this could be dangerous. They may need to be sawed off with a hack saw.)

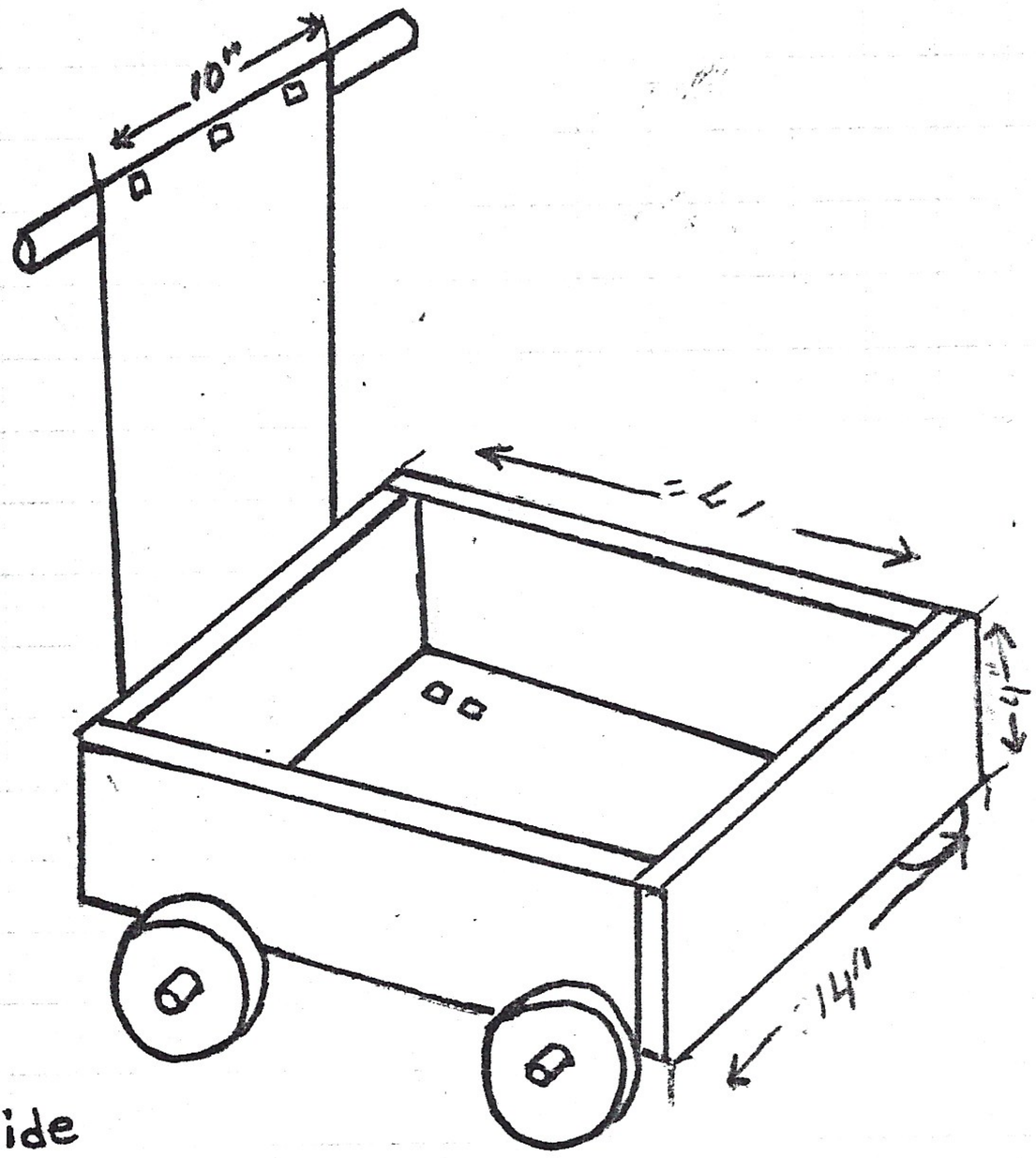
Directions: WHEEL ASSEMBLY

1. 4 C circle brackets were used to secure the dowel rods to the base of the wagon. These must be lined up exactly so the dowel rods fit straight across the bottom of the wagon to enable the wagon to roll easily.
2. These 4 brackets are secured to the masonite bottom with 8 nuts and bolts.
3. Dowel rods are cut to approximately 30" in length and inserted through the brackets.
4. Masking tape is wrapped around dowel rods approximately 1" away from base of the wagon. Thickness should be considered as there must be a tight fit with the center of the wheel.
5. Plastic caps are then glued on the ends of each dowel to offer additional support.
6. Be sure to sand or file rough edges.

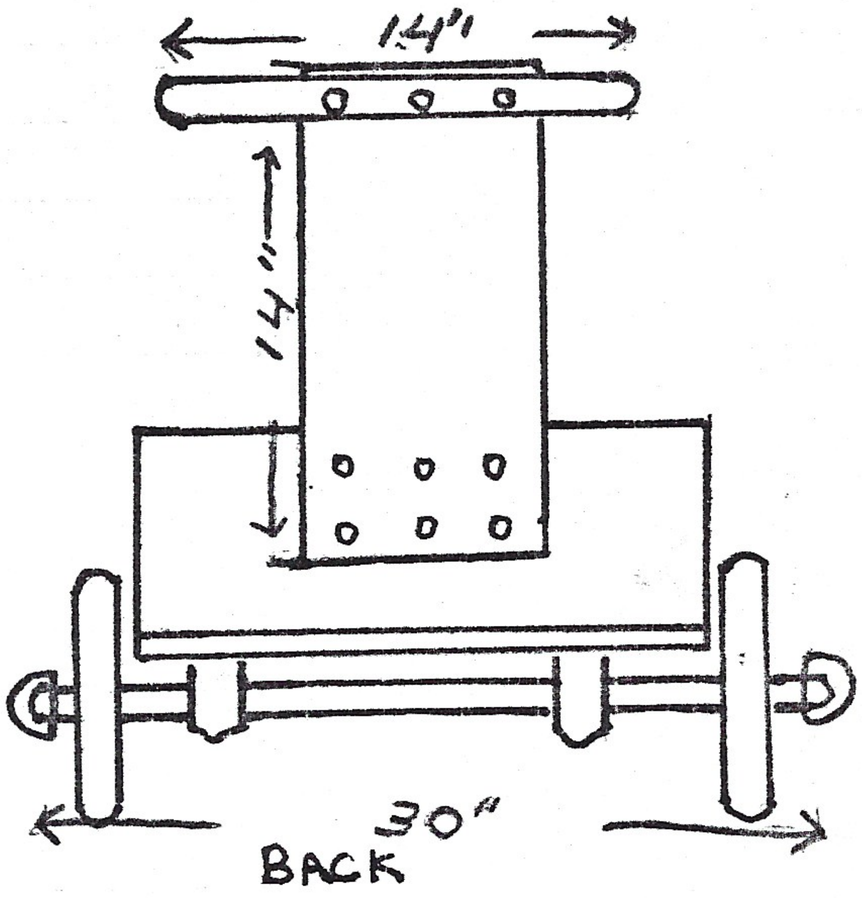
*Wheel and dowel rods roll as one unit.
*Wheels may also be obtained from old toys.

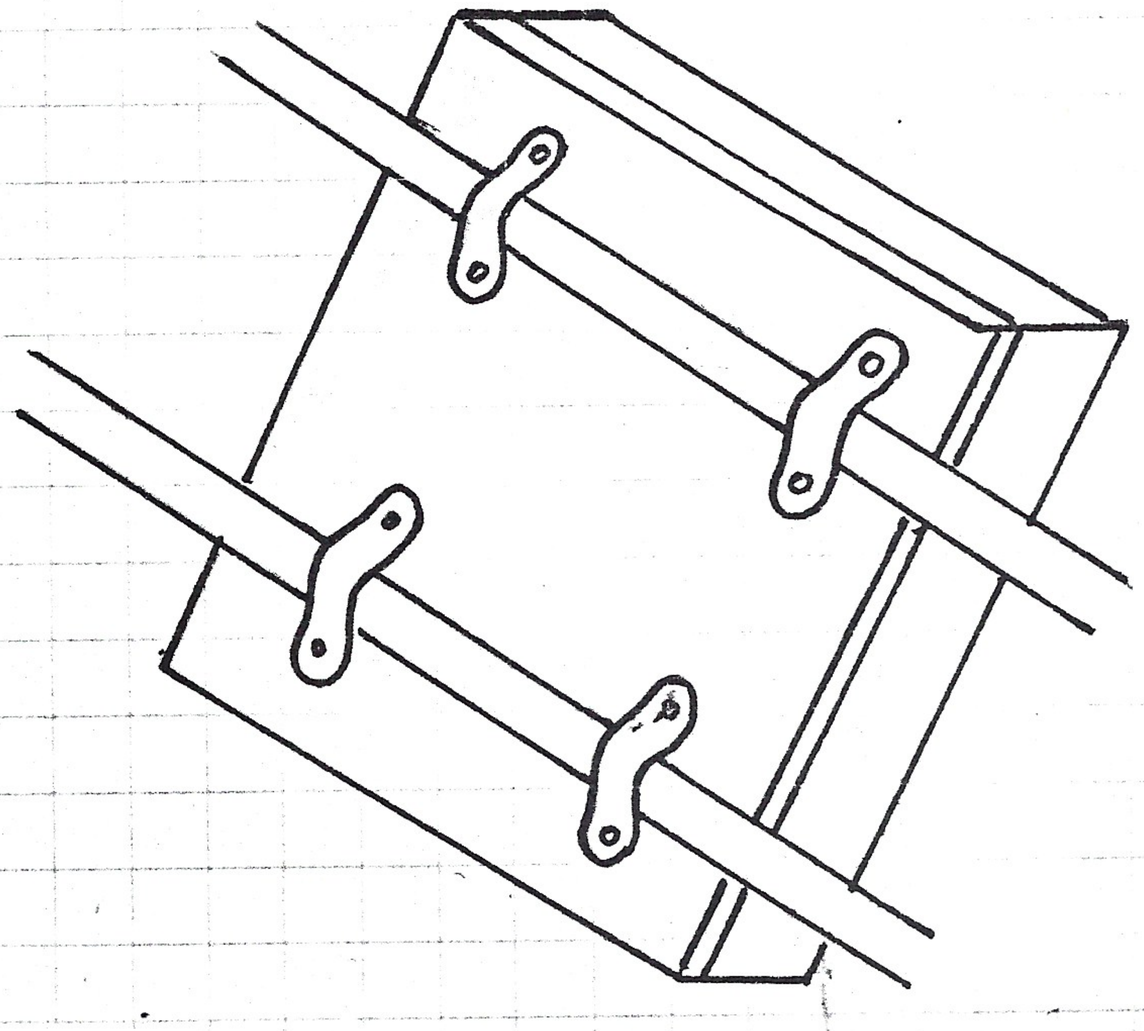
NOT DRAWN TO SCALE

WAGON



Side





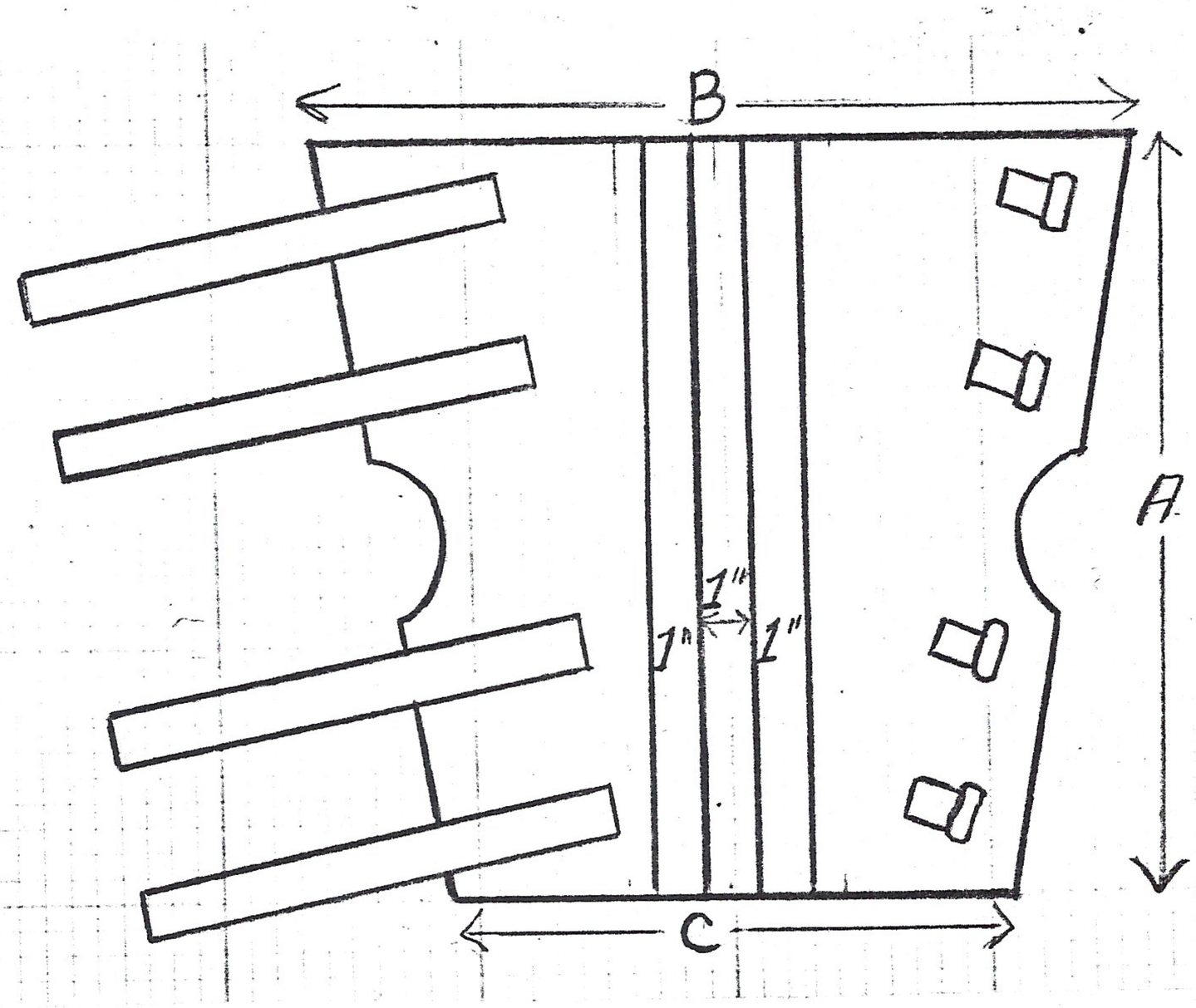
Bottom

KNEE SPLINTS

1) To increase/maintain knee extension.
2) To enable weight bearing on lower extremities.
3) To provide for knee splints of correct size for nominal cost and quick availability.

Precautions and Considerations:

1) Check and make sure stays do not start to poke out.
2) Check skin for pressure points after removal.
3) Do not leave child in knee splints for more than 10 minutes initially, gradually increasing to 30 minutes.



KNEE SPLINTS

Supplies: vinyl
webbing
Velcro
"D" rings
coat hanger wire
Orthoplast (splint material)
heavy plastic tape

Estimated Cost: $5.00 per pair

Directions: (includes adjusting for other children)

A. Cut piece of vinyl.

To determine measurements:

1. (A) measure child from center of knee to over half of thigh and add measurement from center of knee to over half of calf.
2. (B) measure circumference of thigh and add 1".
3. (C) measure circumference of calf and add 1".
4. Taper from B to C.
5. Place around leg with edges at front and draw circle around kneecap, cut out.

B. Cut two pieces of vinyl 2" wide and length (A). Sew each piece on large vinyl as indicated, making channels 1" apart.

C. Cut two pieces of orthoplast 5/8" wide length A minus ½". Cut four pieces of coat hanger wire length A minus 1". Tape two pieces of wire to each Orthoplast piece. Place in channels.

D. Cut four pieces of webbing 3" long and fold over "D"-ring, sew in place as indicated.

E. Cut four strips of webbing approximately 6½" long. Sew in place as indicated.

F. Try on child, mark for Velcro. Sew Velcro in place.

FEEDBACK HEAD CONTROL DEVICE

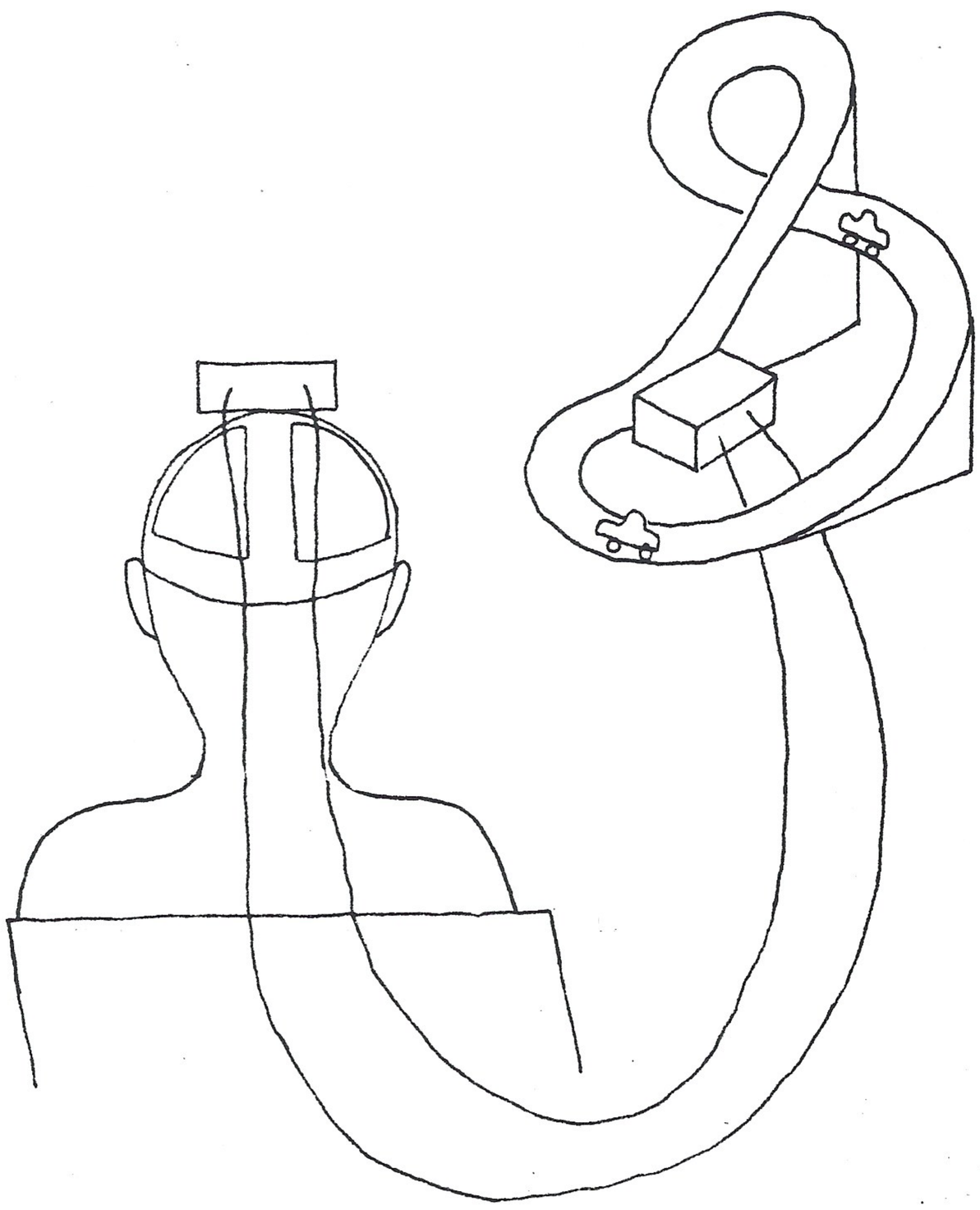
a. To improve head control in an upright position.

b. To provide an immediate and consistent re-inforcer for attempts to maintain upright head control.

c. To enable the child to work independently on head control without the teacher's constant presence.

d. To appeal to child visually and auditorily and to stay within his visual field.

e. Toy must be battery operated and battery must not be in a moving part.



FEEDBACK HEAD CONTROL DEVICE

Supplies: Mickey Mouse Fun Castle Roller Coaster by Illfelder Toy Co., Inc., New York, N.Y. (available at Toys R Us, Chicago, $8.97)
2 "C" batteries
4 mercury switches 99¢ each (available at Radio Shack)
insulated wire
styrofoam - 2 pieces 4" square X ½" thick scraps to tilt mercury switches
fabric
white glue

Estimated Cost: $15.00

Directions:

1. Mercury switches were wired together as in diagram and glued into position on a piece of styrofoam (white glue can be soaked to unglue if repositioning is necessary). Tilt switches as shown in fig. 2, so that it will not be too difficult for child.

2. Another piece of styrofoam was placed over the switches and then they were placed into a fabric case.

3. A head piece was made to fit the child's head and tie under his chin. It consists of a band around his head, a band from front to back, and a band from ear to ear across the top of his head which intersects the front to back band at the top of his head. Velcro is sewn onto the bands at the intersection and onto the bottom of the mercury switch case.

4. Disconnect the wires to the "on-off" switch in the toy and fasten them to the wires leading from the mercury switches.

5. Assemble toy. Place it out of reach, but in full view of child. Be sure child is well positioned and stabilized. Place head piece on child and fasten mercury switch case on head piece with wires out of reach of child.

FEEDBACK HEADCONTROL DEVICE

Wiring Diagram

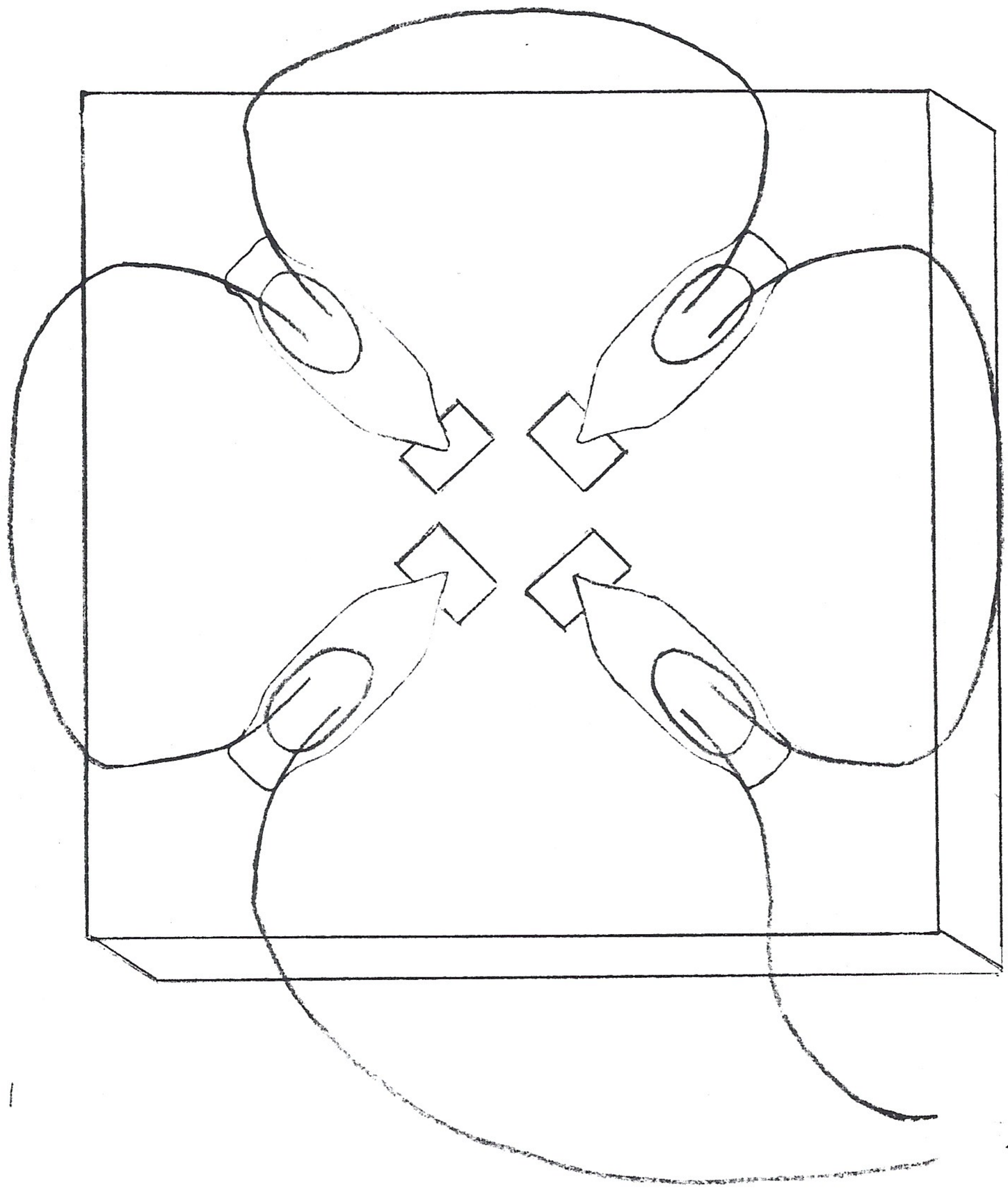


Fig. 1

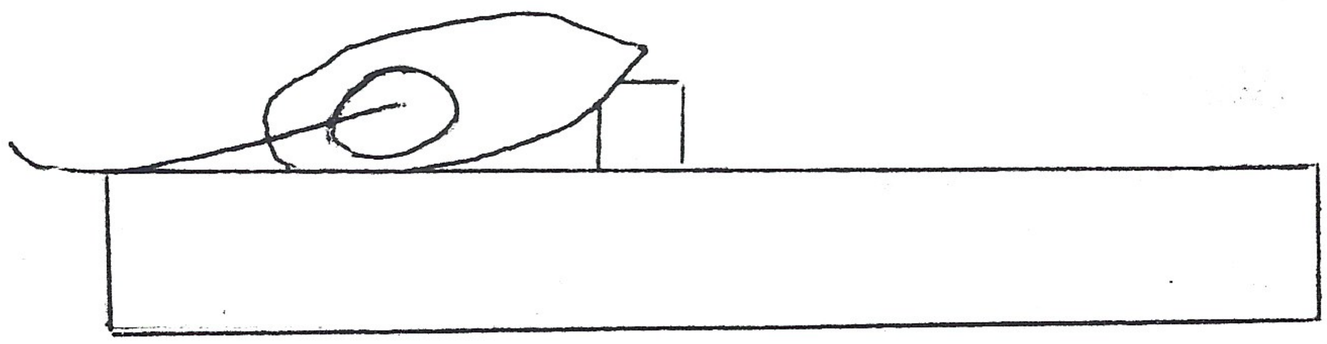


Fig. 2

EASEL

To provide a larger working surface for a child with limited reach on a horizontal surface.

TRAY EASEL

Supplies: Tri-wall
2" gummed (paper) tape for edges
cloth tape for hinges
glue from prop positioners
paint

Estimated Cost: $4.50

Directions:

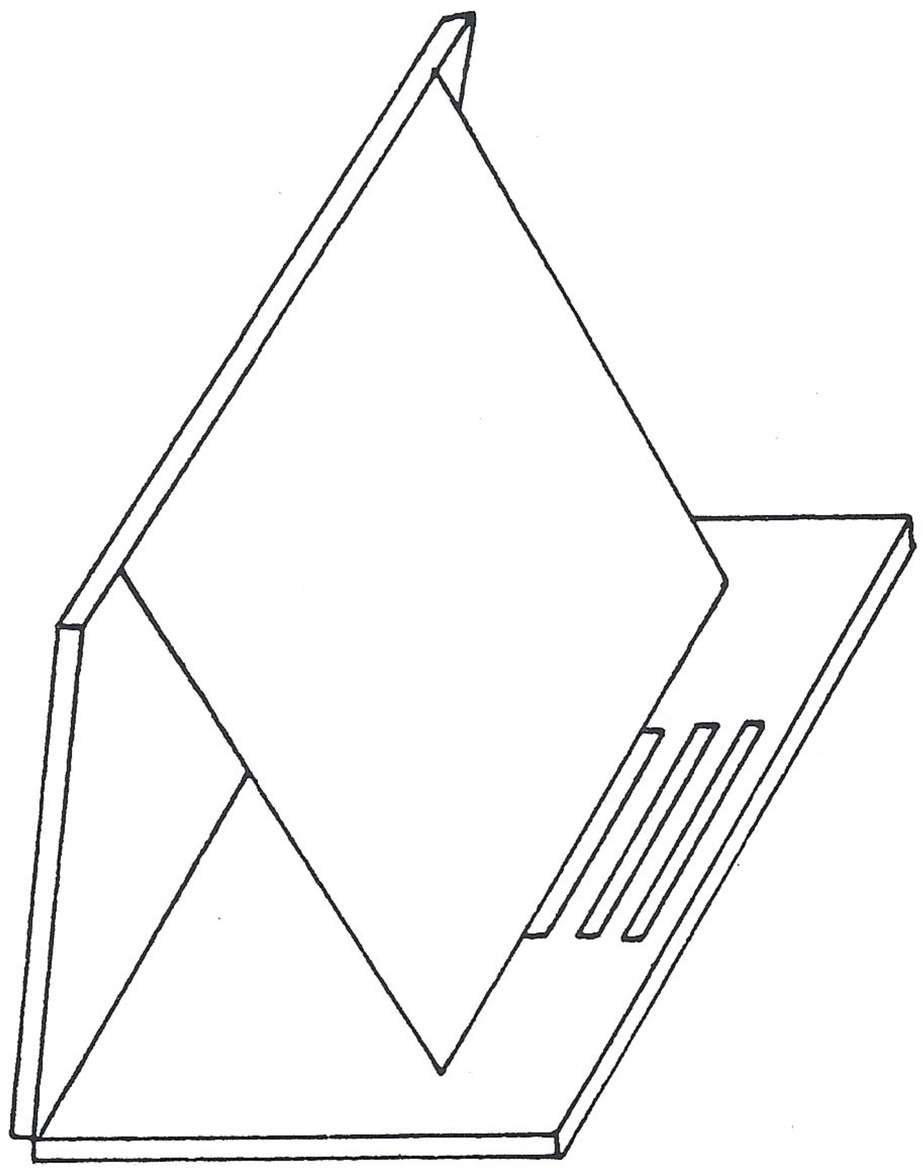
1. This easel was made to fit in a tray with a rim around the edges. The dimensions were determined by the inside dimensions of the tray and how far the child could reach.

2. Cover edges of ease, base, and prop with paper tape.

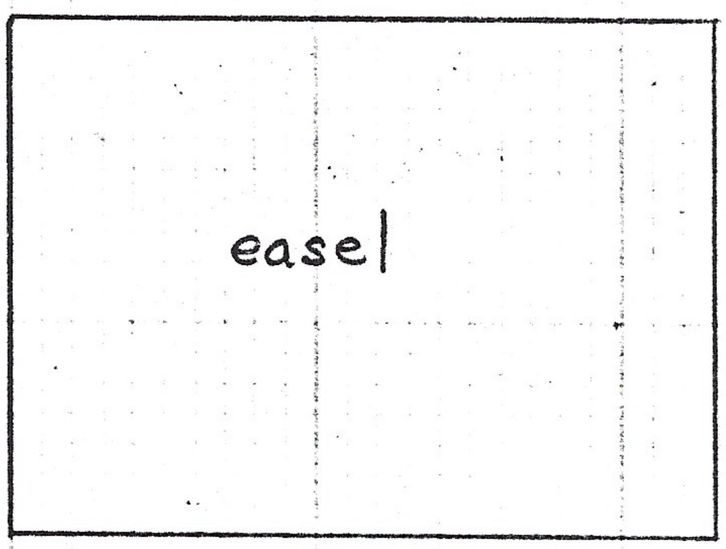
3. Paint both sides of easel.

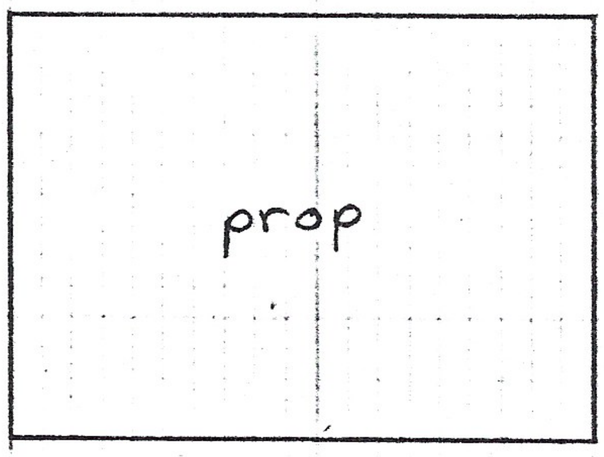
4. Tape base and prop to easel with cloth tape to form flexible hinges.

5. Glue prop positioners on base.



TRAY EASEL





Tri Wall

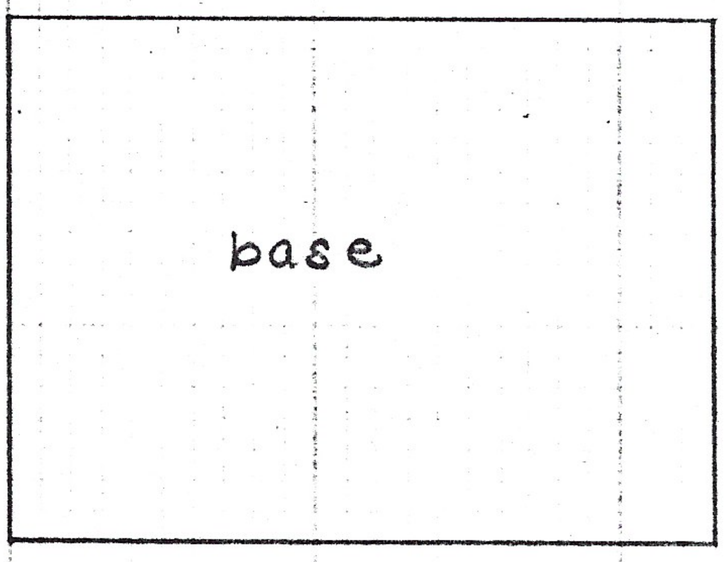
Paper tape for edges

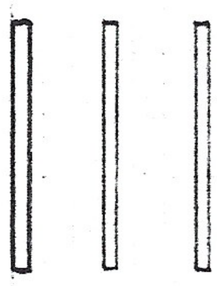
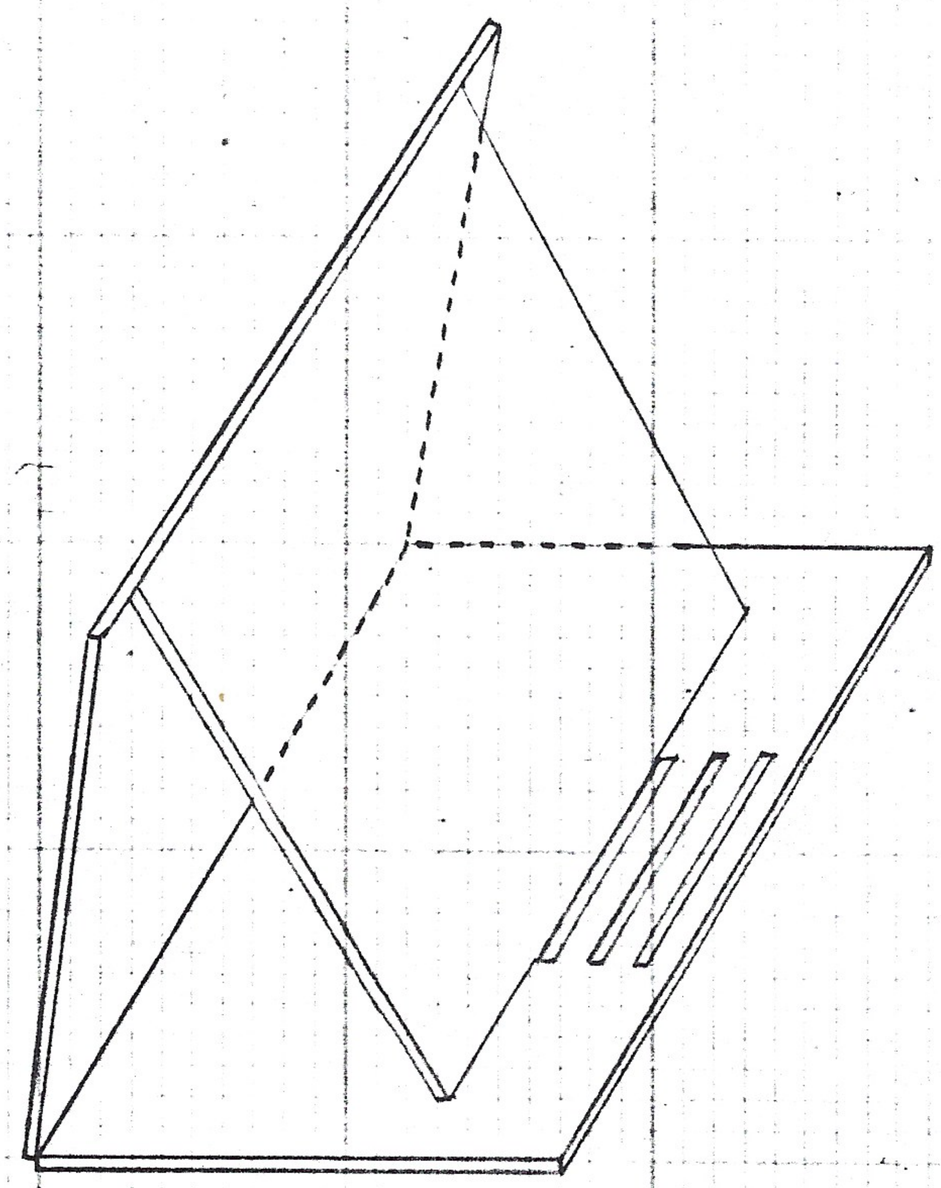
Cloth tape for hinges

Glue for prop positioners

Paint

Cost @ $4.50





prop positioners